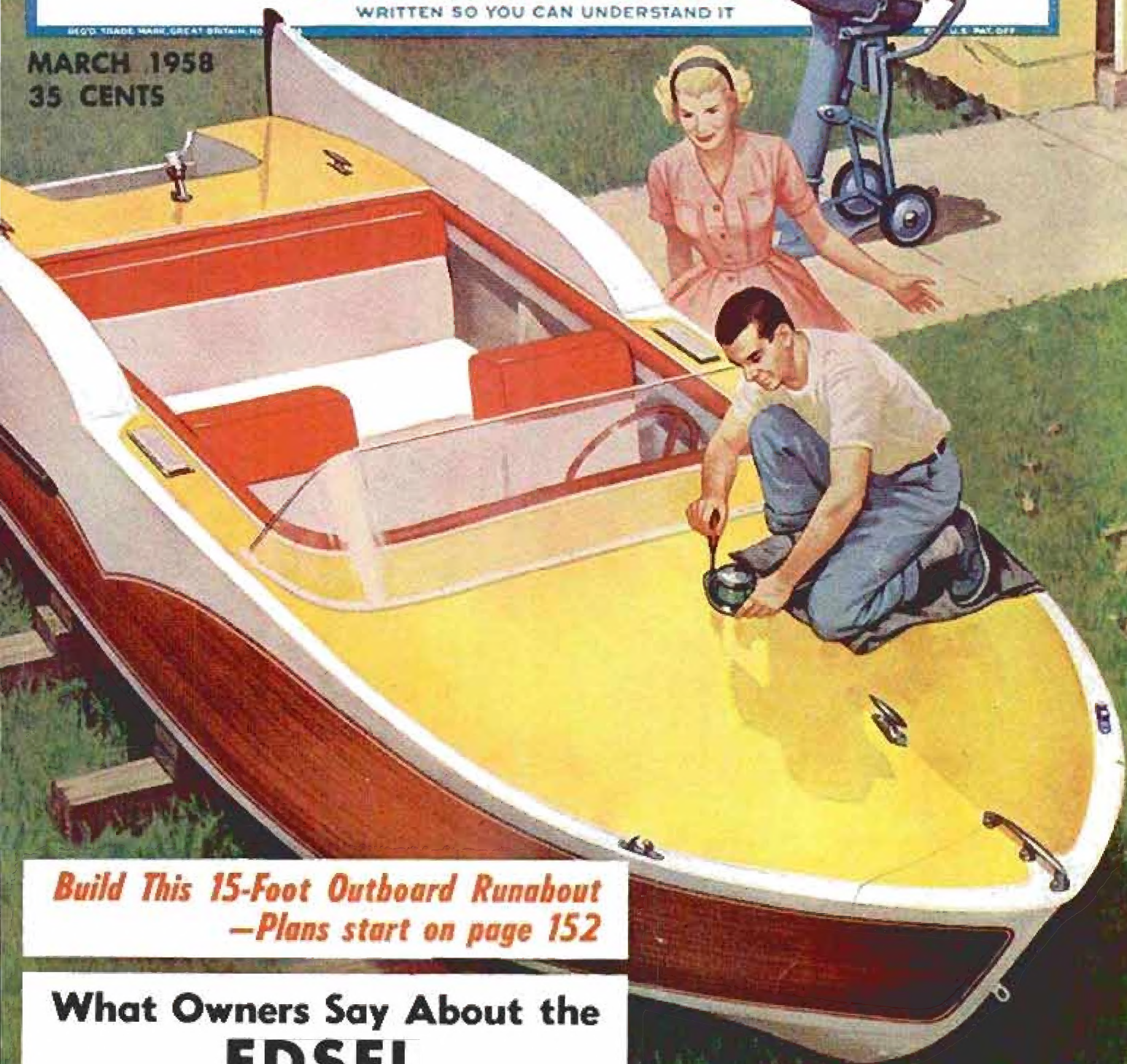


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MARCH 1958
35 CENTS



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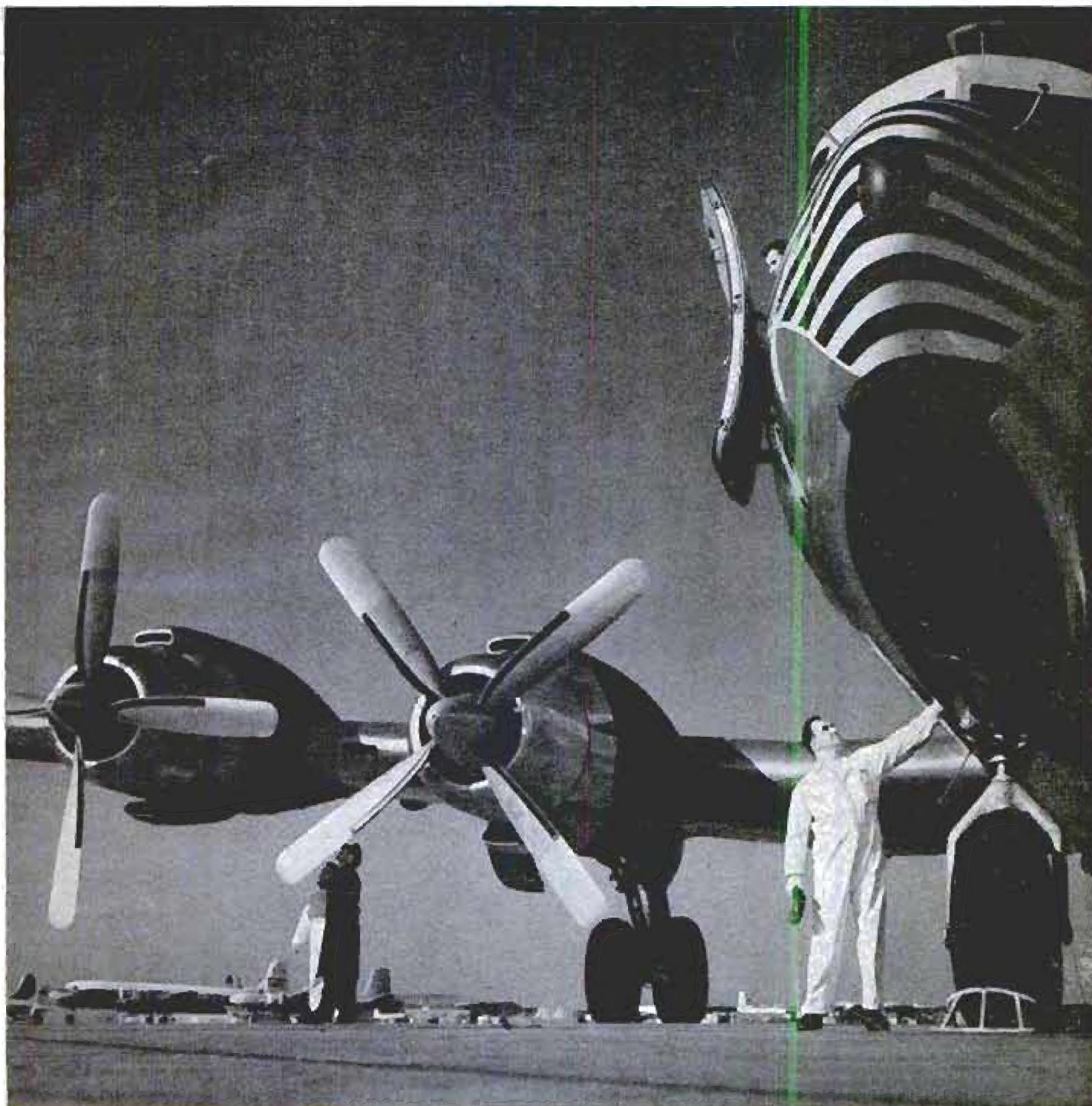
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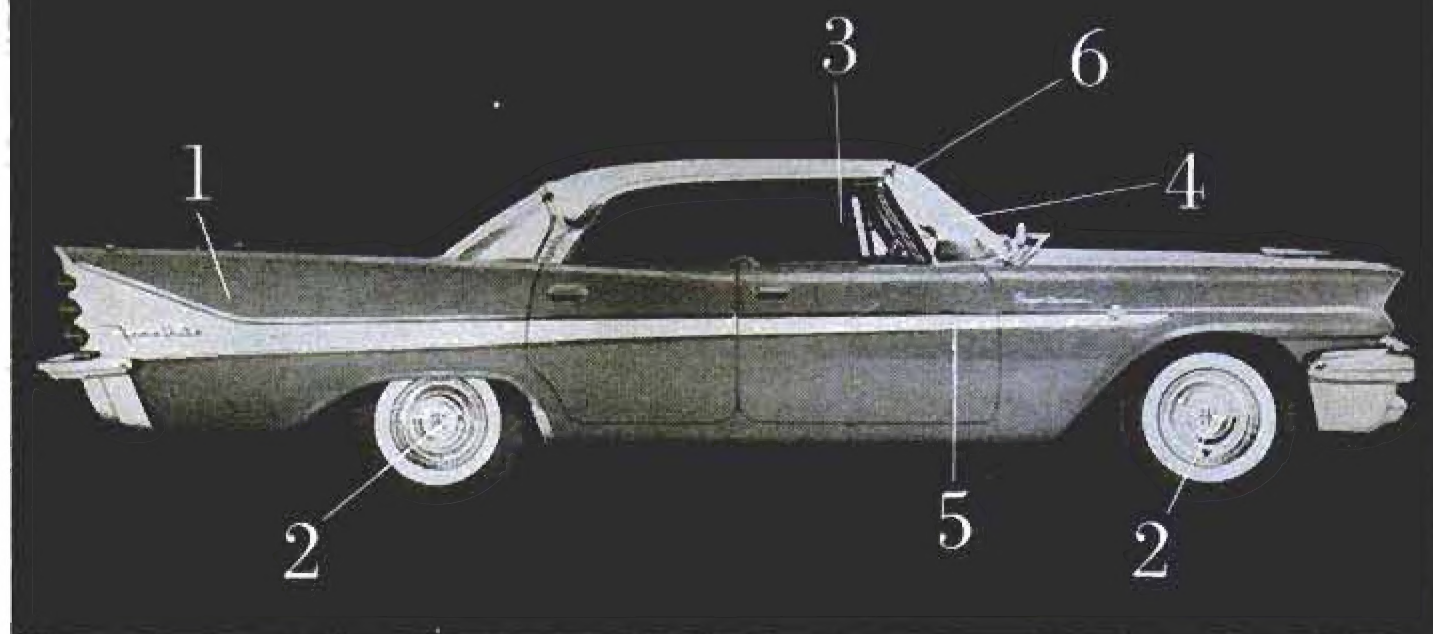
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Published monthly by Popular Mechanics Company,
200 E. Ontario St., Chicago 11, Ill. H. H. Wind-
sor, Jr., president; Wm. Harrison Petridge, exec.
vice-pres.; Franklin S. Forsberg, operations vice-
pres.; D. P. Windsor, vice-president and secretary-
treasurer; H. H. Windsor III, vice-president; W. T.
Windsor, vice-president; Joseph H. Buell, Jr., ad-
vertising manager; Alan M. Deyoe, circulation
manager. Single copy in the United States and
Canada, 35 cents; subscription rates in the United
States and possessions, Canada and countries of
the Pan-American Postal Union, 1 year \$3.50; 2
years, \$6.00; 3 years, \$8.00. To all other coun-
tries add \$1.00 a year over United States prices
for overseas postage. If you plan to move, notify us
at least 30 days in advance so you will not miss
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Entered as Second Class Matter, September 15,
1903, at the Post Office at Chicago, Illinois, under
Act of March 3, 1879. Entered as Second Class
Matter at Post Office Dept., Canada. Registered
as Second Class Matter at the Post Office at
Mexico, D.F., Mexico, June 20, 1950.
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MARCH 1958

Number 3

Address all communications to: 200 E. Ontario St., Chicago 11, Ill.

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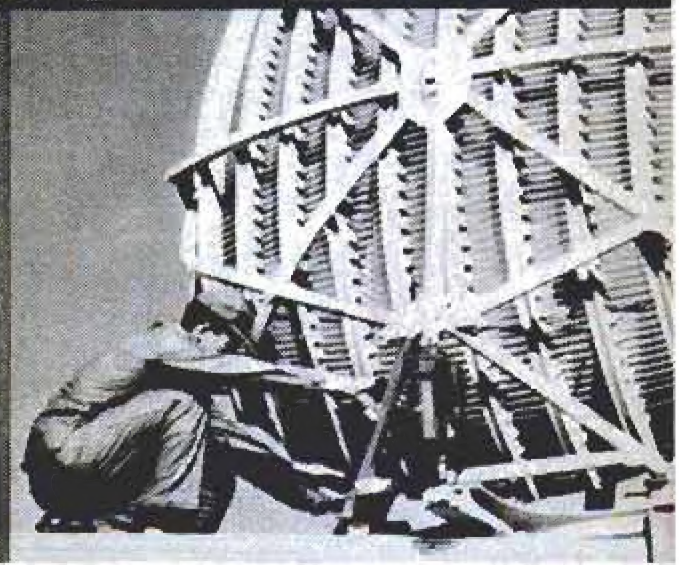
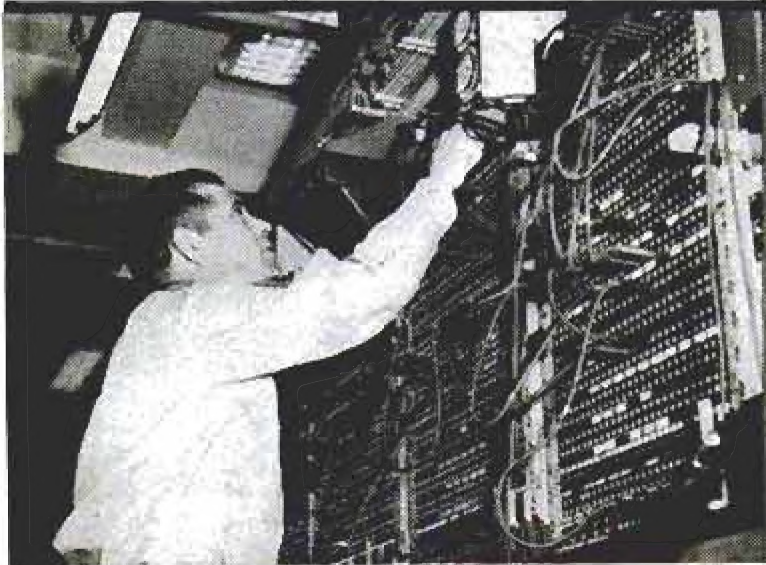
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Next Month...

ALL-PURPOSE CART for golf on week ends, for errands and "school bus" during the week, for the aged or invalids or just for fun for the young members of the family is a do-it-yourself feature for April. Also, an out-door-living section with a smart patio-family room



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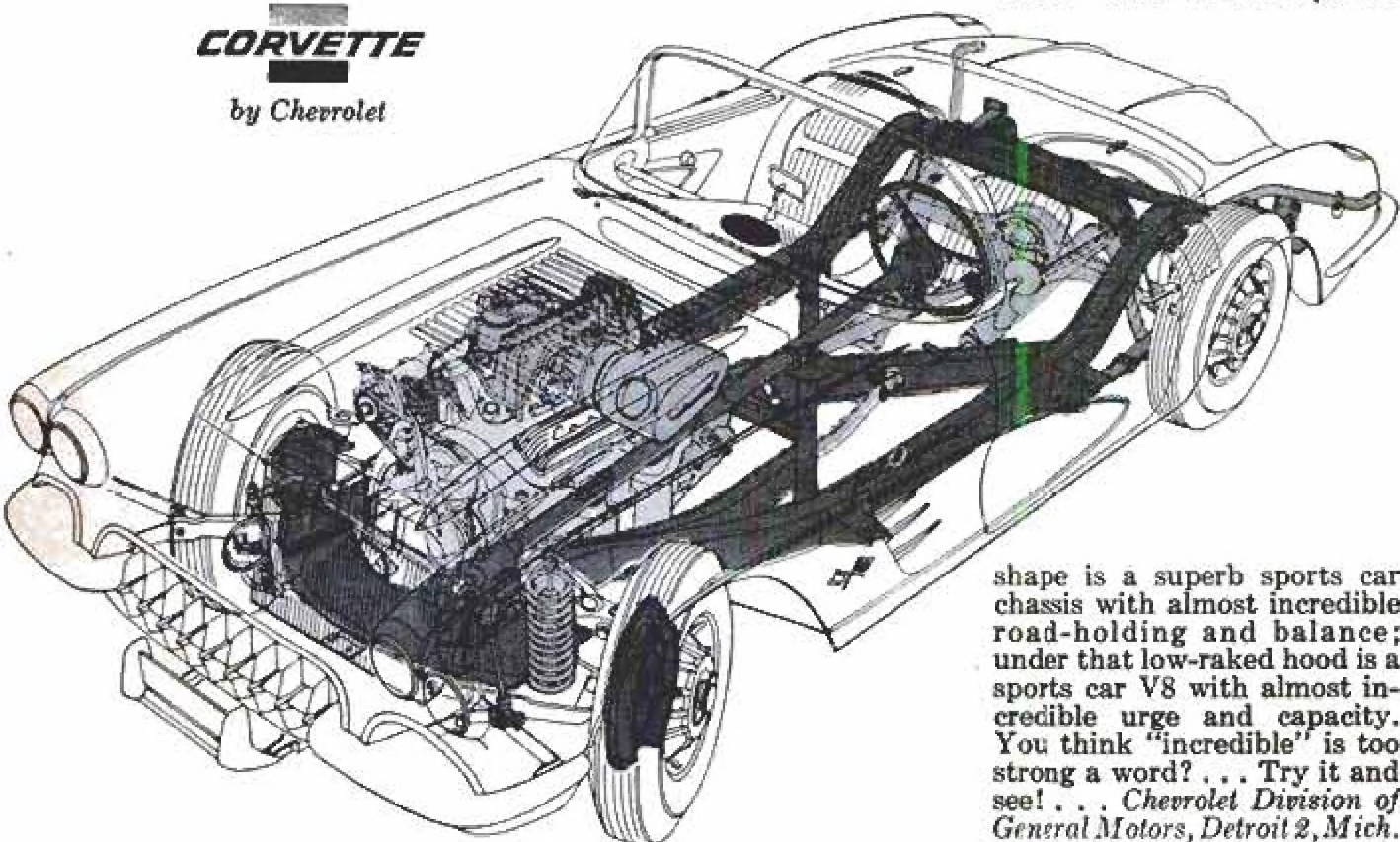
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corvette for '58

CORVETTE
by Chevrolet

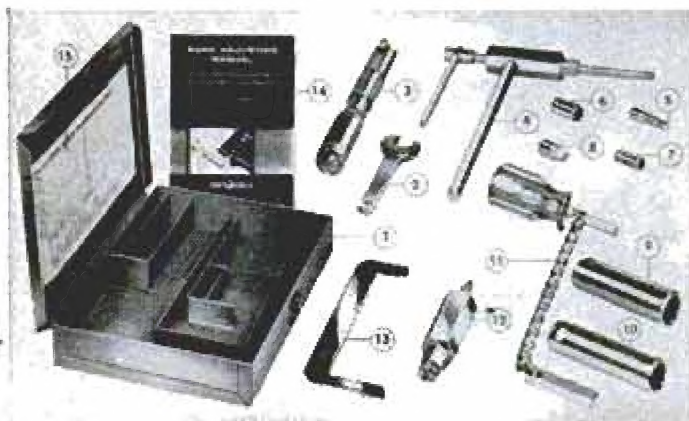


shape is a superb sports car chassis with almost incredible road-holding and balance; under that low-raked hood is a sports car V8 with almost incredible urge and capacity. You think "incredible" is too strong a word? . . . Try it and see! . . . *Chevrolet Division of General Motors, Detroit 2, Mich.*

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4. 2357	Band Adjuster
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6. 4710S	Socket—8 point (5/16" op., 1/4" drive)
7. 4710	Socket—6 point (5/16" op., 1/4" drive)
8. 4743	Screwdriver bit (3/8" bit, 1/4" drive)
9. 5324	Socket—12 point (3/4" op., 1/2" drive)
10. 5322	Socket—12 point (11/16" op., 1/2" drive)
11. 2359	Handle and gage (1/4" drive, 1/4" gage)
12. 2354	Servo Gage—Front
13. 2355	Servo Gage—Rear
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ACROSS THE DESK



To the Editor:

This is in reference to an article which appeared in *Popular Mechanics*, April 1957, entitled "Wooden Lung Saves Lives In India."

At the World Congress of Junior Chamber International in Tokyo, Japan, the International Council directed that literature concerning the wooden lung be distributed to Junior Chambers throughout the world. This is done with a view to assisting lesser developed countries provide more adequate medical equipment for their citizens.

I have the six-page mimeograph directions on building wooden lungs (and) six sheet directions produced by *Popular Mechanics*. We would like to publish a project digest, directions on how-to and whom to contact for assistance.

John A. Nesbitt,
Program Director,
Editor, JCI WORLD

EDITOR'S NOTE: *Permission is gladly granted. Plans for the mechanical "lung" for paralysis victims were first published in PM for January 1952. Leaflets describing its construction may be obtained by writing the Book Dept., Popular Mechanics.*

To the Editor:

I am a regular reader of *Popular Mechanics* and have been for 10 years. I enjoy seeing pictures and accomplishments of others. I am enclosing a snapshot of myself

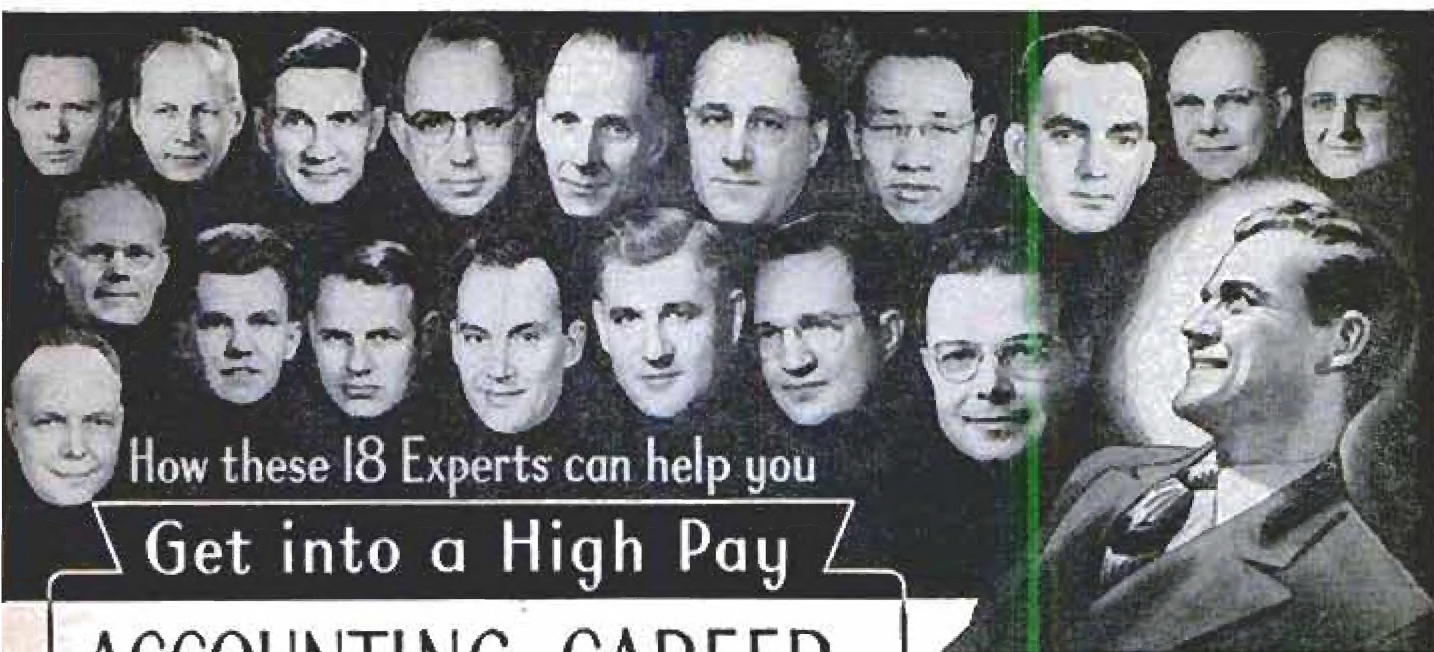


and a roadster I remodeled in spare time.

I am a manager of an alfalfa-dehydrating plant. This is a process whereby green alfalfa is cut from the field and manufactured into pellet form for livestock.

I started with a two-door Crosley coach. I altered the body considerably, replaced the original engine and transmission with

(Continued to page 8)



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Yes, if you are really sincere in wanting to better your position—start your income climbing—enjoy a lifetime career of high standing and high reward—this friendly staff of experts can help you.

(Continued from page 6)

a V4 Wisconsin air-cooled motor and a Chevrolet transmission. This car has a maximum speed of 70 miles per hour and is very economical on gas, using about one gallon of gas for 38 miles. It weighs 995 pounds.

Dwayne L. Green,
Lexington, Neb.

To the Editor:

Your article in the December issue ("What Makes a Driver Tired") was of particular interest to me. In 1929 I bought a De Soto roadster. It was beautiful and I felt like a queen driving along. We still have it and use it. I have had a De Soto sedan, two Plymouth sedans, and am now driving a 1948 Dodge. The De Soto is in the garage and the Dodge is out in all kinds of weather. That is for two reasons: The Dodge is too wide for the doors, and there is always someone wanting to buy the De Soto. About six people will stop on a Sunday to see if it is for sale. The most we've been offered is \$600. My husband likes to drive it as it takes up so little room when parking. We have found it is just as good in many ways as the Dodge. It will always draw a crowd, too. Thanks for the article.

Mrs. S. C. Wardwell,
Bristol, R. I.

To the Editor:

After completing a millwright apprenticeship in 1908, *Popular Mechanics* became my "bible."

At an Alaskan salmon cannery the stovepipes in all of the fishermen's cabins had to be renewed each season. The foreman berated me for cutting short lengths of pipe out of square, until I read in *Popular Mechanics* that if you wrap a piece of light cardboard around the pipe until the ends meet, mark around with a pencil, then make a hacksaw cut on the seam, insert tin snips and cut to the line, you will always have square-cut pipe sections, or 45-degree angles may also be made in this way.

After cutting timbers incorrectly because of measuring with a long linen tape, which of course stretches, I mended my ways by learning from *Popular Mechanics* always to use a steel tape to lay out such work.

Tools and supplies are not so readily available in far-flung Alaskan points as in the city where you can drop into the corner hardware store. We were running short of hacksaw blades while cutting short lengths of water and steam pipe. This was until the mail arrived with *Popular Mechanics*. Here I learned that if you reverse the blade in the frame, so reversing the pitch of the teeth, you will not strip the teeth.

(Continued to page 10)

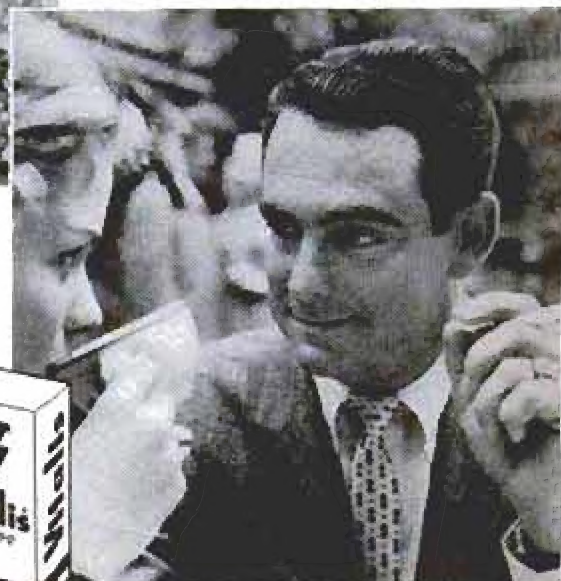


Man with a tough hair problem

Bill Flick of New Orleans captains a 45-foot cruiser for fishing parties. His hair takes a beating from sun, wind and spray.

He licks it with Vitalis

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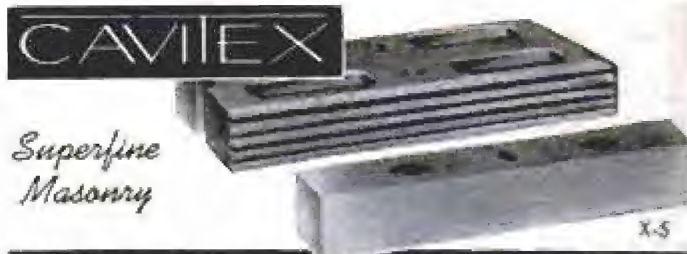
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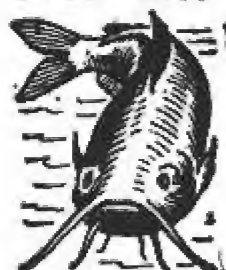


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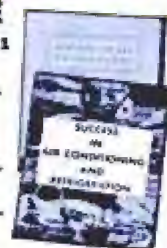
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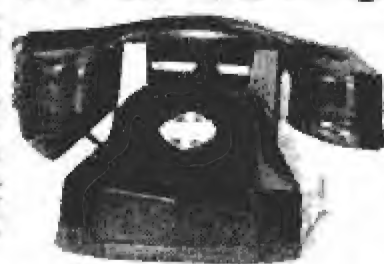
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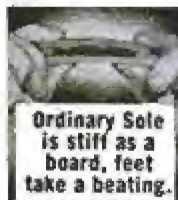
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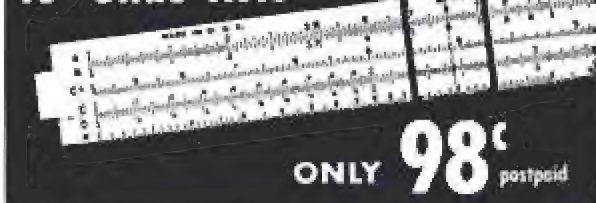
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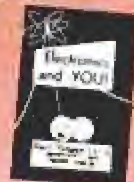
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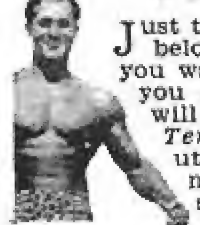
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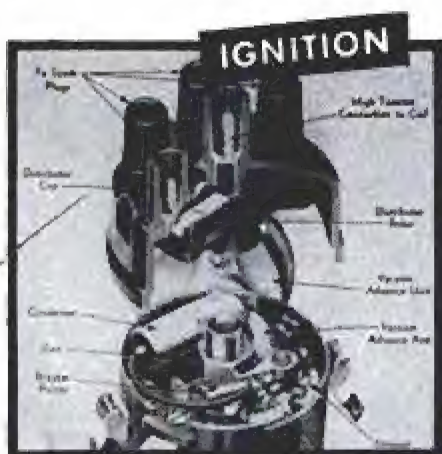
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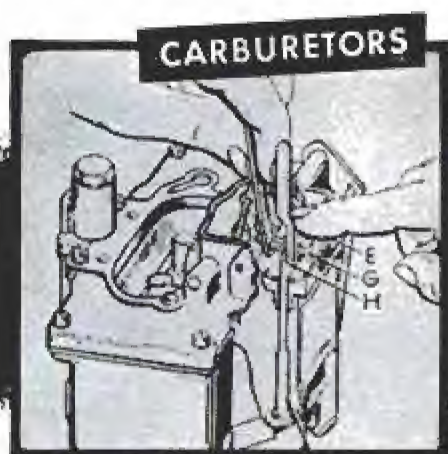
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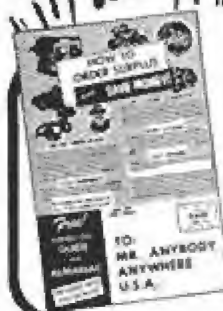
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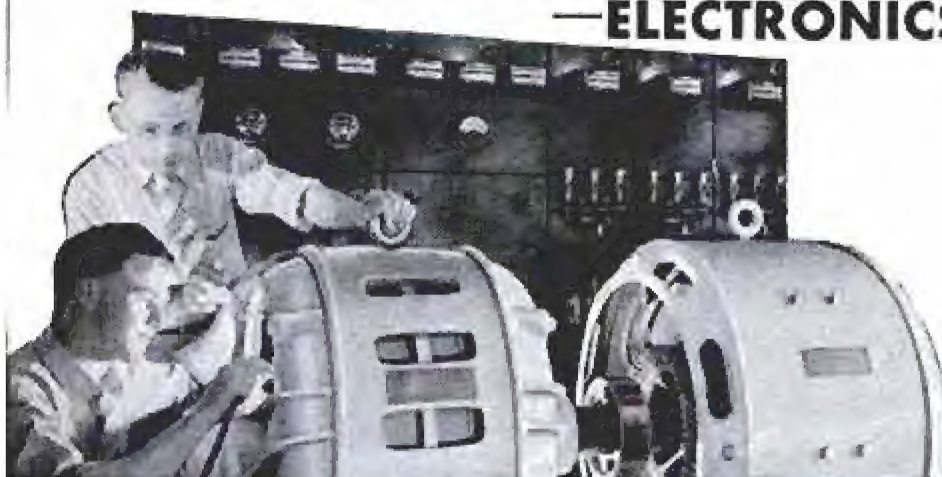
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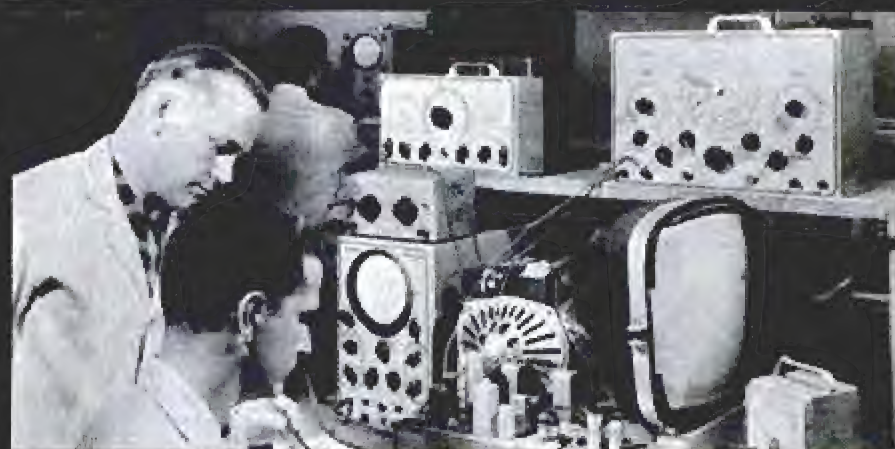
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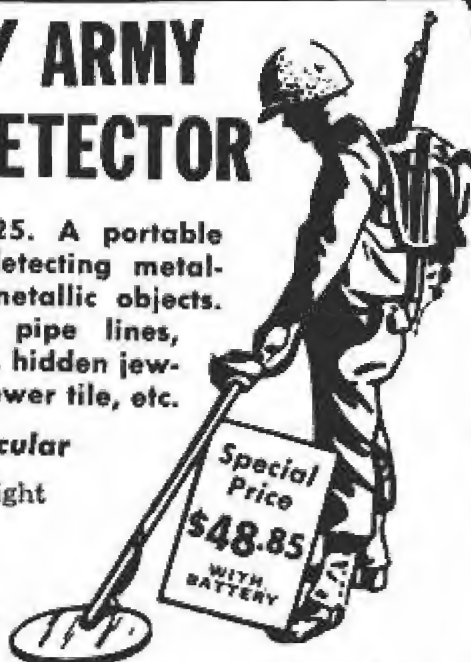
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summer home, my Cadillacs, my Winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish*! And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned*! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept

something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows". It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turn-

ing out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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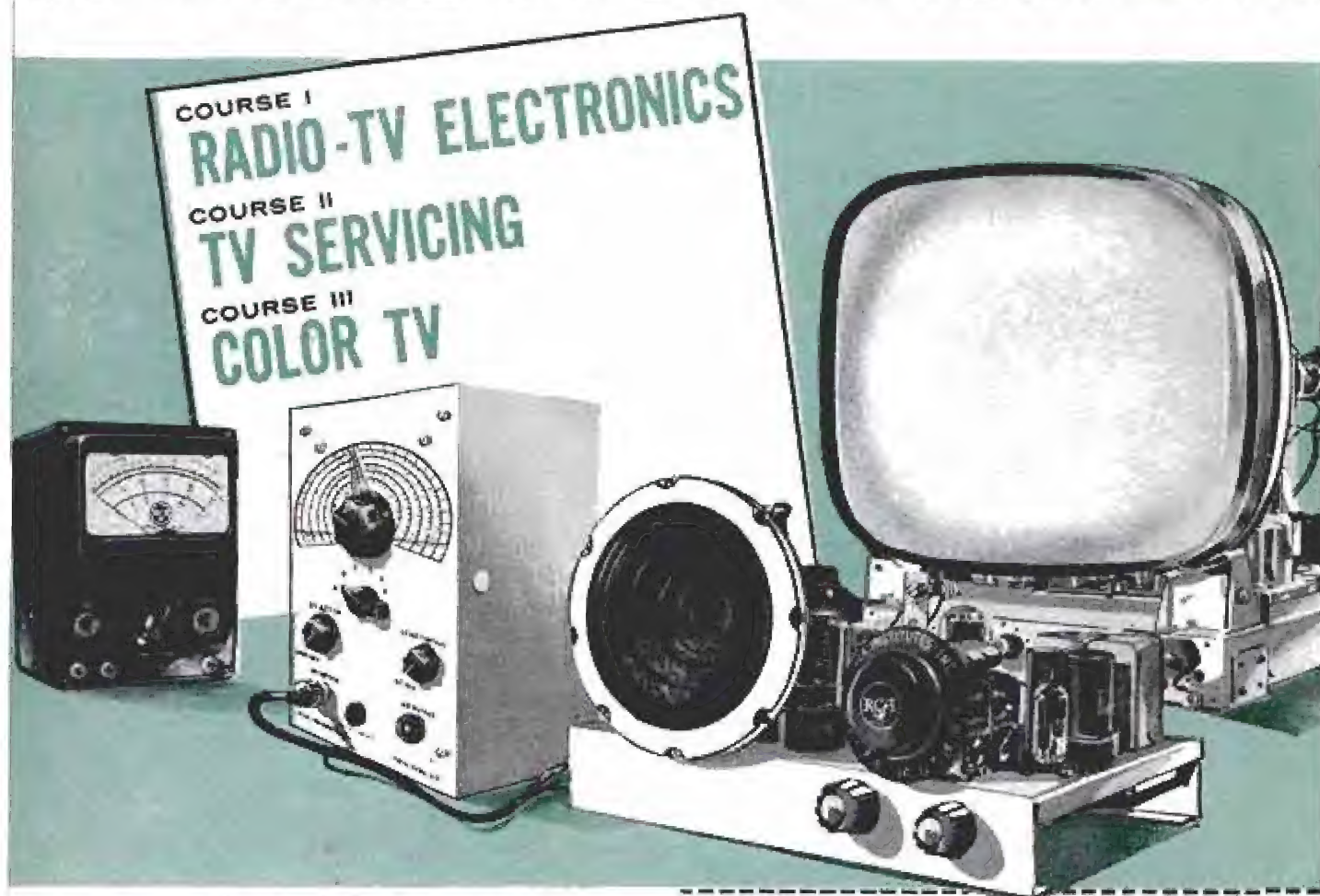
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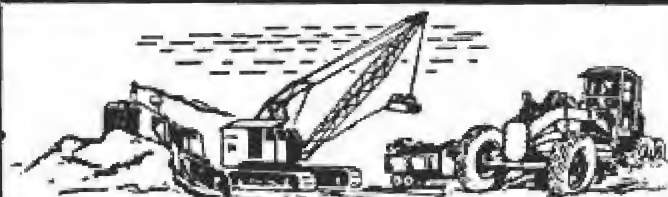
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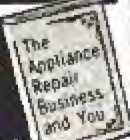
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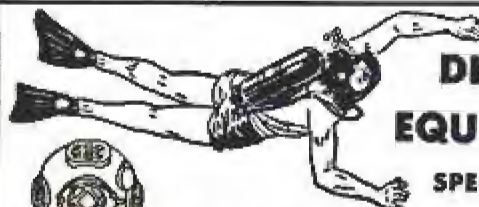
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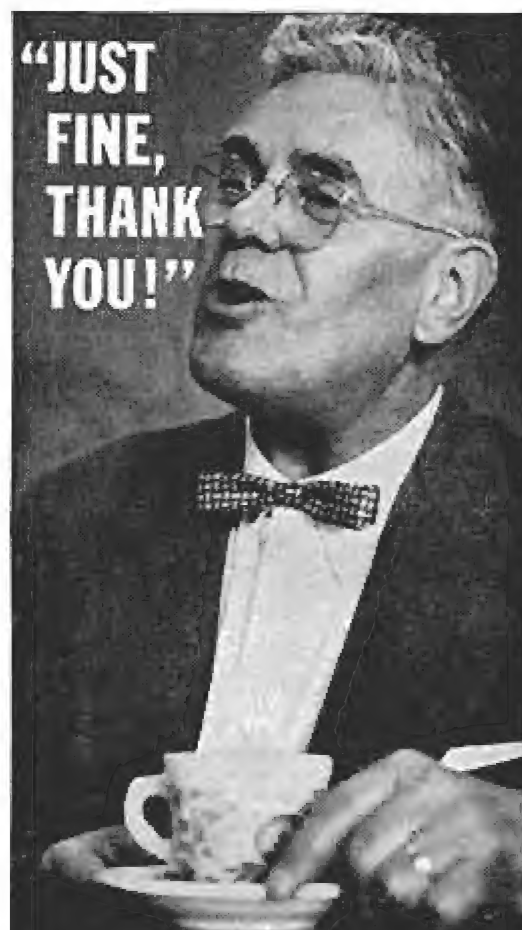
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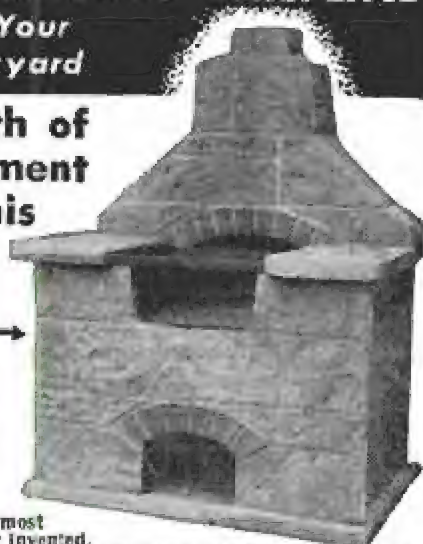
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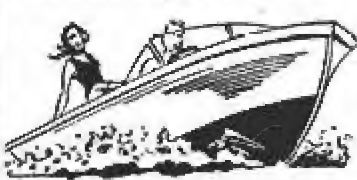
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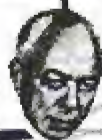
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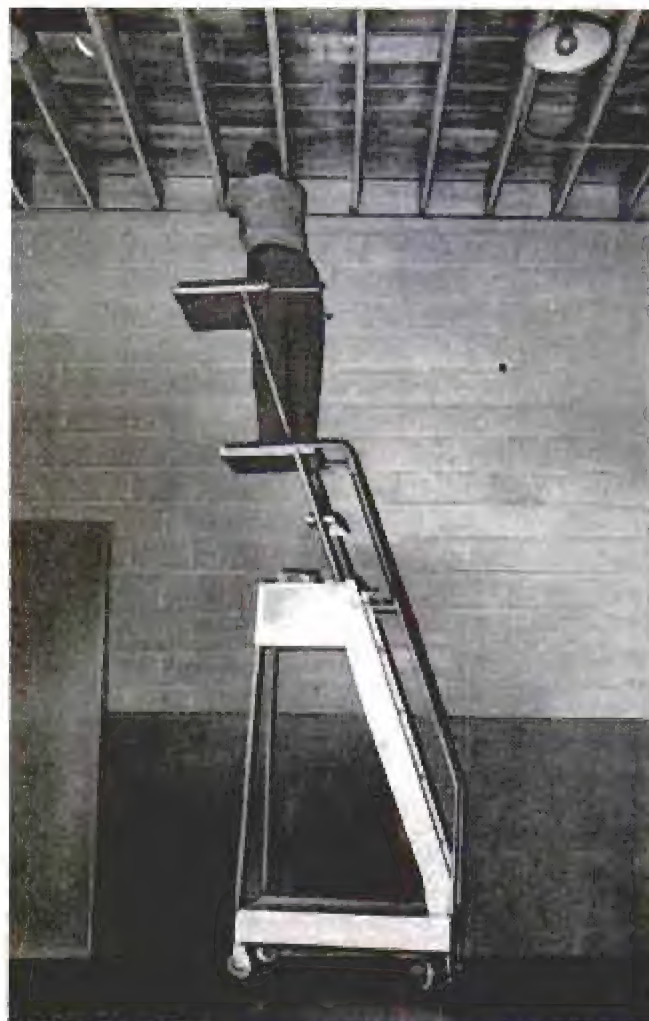
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Industry Stresses Education

Industry is well aware of the fact that to keep ahead of competition in product development, production, and sales, its employees must be skilled and well trained. Industry recognizes also that manufacturing methods, automation, complicated production machinery, higher production quotas and daily discoveries in science and technology are increasing the amount of knowledge and technical skill it takes to understand and keep pace with the changes as they occur. As a result, employees are now being required to meet much stricter and higher educational standards in a great number of occupations.

U. S. Department of Labor surveys covering present and future employment prospects in major industries and

occupations call attention to these important points:

● New technological developments in all fields of industry and in the professions will accelerate the trend toward more jobs for the educated and skilled and fewer opportunities for the unskilled.

● Irregular employment and lower wages face the uneducated in the economy of today.

● High school graduation has become the minimum educational standard for employment in most clerical positions, apprenticeships and many other types of work. Those not completing high school will be increasingly handicapped in competing for jobs above the manual-labor or semi-skilled level.

● In many professions, the period of college education customarily required for employment 20 years ago has increased substantially and will lengthen further due to emphasis being placed on education.

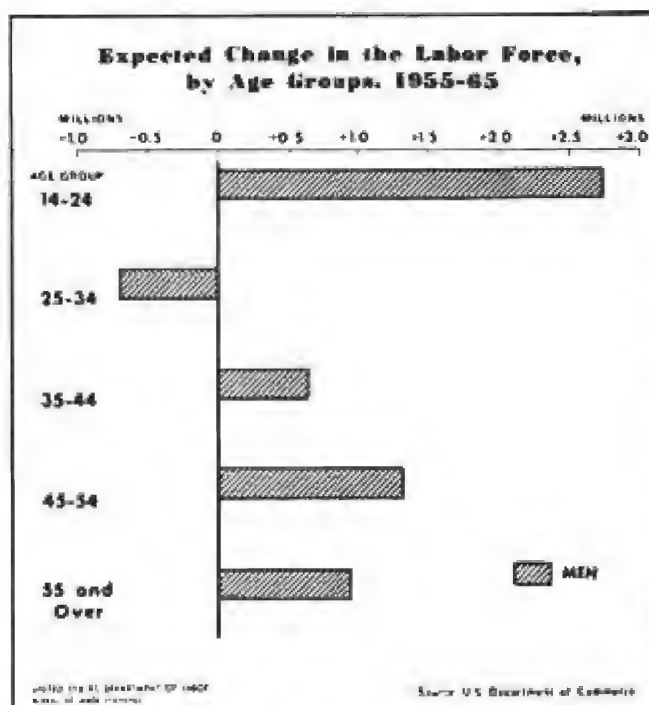
It has also been pointed out by the Department of Labor that the more education a person has, the higher his income is likely to be. For instance, it is estimated that the high school graduate, during his adult years, will receive \$50,000 more than the eighth grade graduate and \$30,000 more than the student who drops out of high school.

As we come to depend more and more on machines and as our industrial society grows more complex, the need for well educated, creatively intelligent and independent thinking people will multiply. Future employers will be interviewing candidates for jobs very carefully to see if their abilities and knowledge measure up to the technical and skilled work that must be done. Employers will put a very high premium on education. Those persons who have it will be hired into responsible positions where they may expect advancement. Those persons who fail to take advantage of educational opportunities will occupy mediocre jobs with little chance for promotion. The choice between the two will be up to the individual.

Furthermore, there's the matter of job competition! The chart illustrates that by 1965 there will be approximately 700,000 fewer men aged 25-34 available to employers due to low birth rates of the Depression years than there are today. The gap in this productive age group accounts for the shortage of skilled manpower and means that those

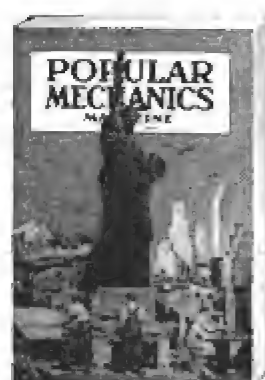
persons who will be in the 25-34 age bracket in 1965 must be educated to the utmost now to fill the technical, and professional jobs crying for applicants.

After 1965, however, notice the millions of young men in the 14-24 age group who will then be competing for jobs. This competition will be keen because of the numbers applying. Those men with the most education will get the best jobs and promotions!



Here, then, are some of the reasons why education and training are of such importance. To have enough education is to succeed . . . "Your assignment (job) can be as big as your talents." To have too little education is to fall into mediocrity and possible unemployment. The choice is entirely up to the individual!

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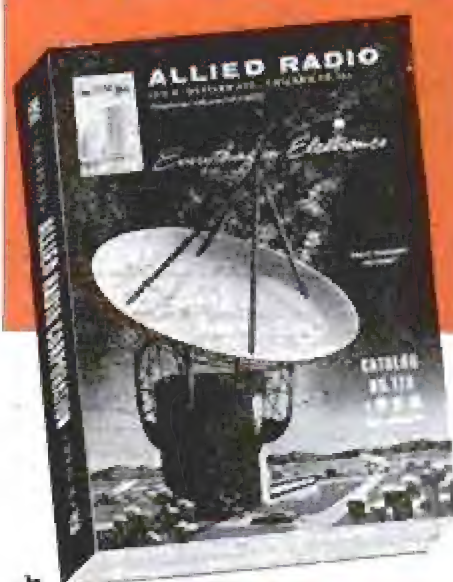
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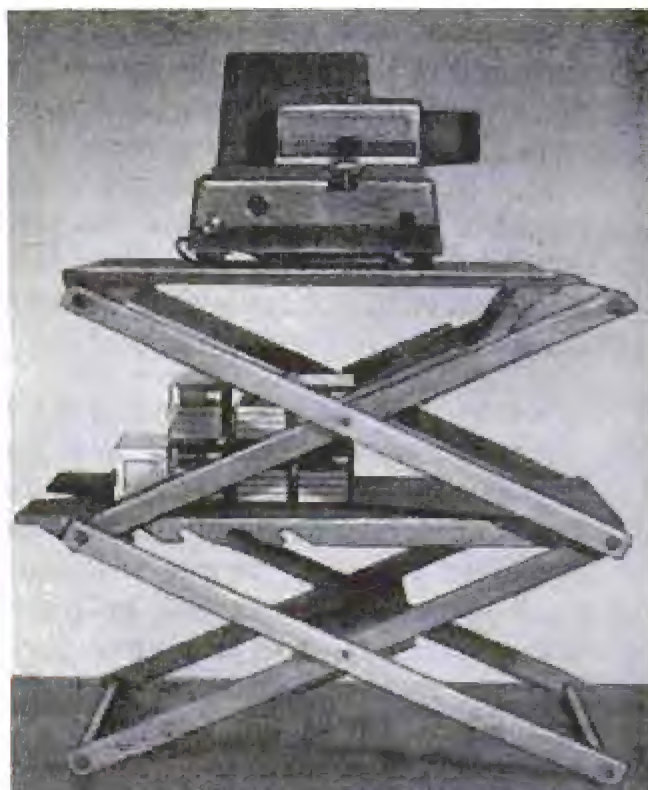
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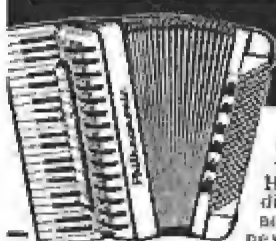
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MARVELOUS "Wonder shoe shine spray." Unusual 10 second demonstration item, retails to \$2, your cost 60¢. Send for free information or \$1 for sample. Princeton Industries, 300-M Northern Boulevard, Great Neck, New York.

BIG Profits. Stamp social security plates, key protectors. Sample 50¢. Catalog free. General Products, 188-PM State, Albany 10, N. Y.

BEAUTIFUL Feather pictures! Free details, sample 20¢ stamps. Apartado 1668, Mexico 1, D. F.

DRYCLEANS Clothing for only 10¢ per garment. Lightning seller. Saves dry-cleaning bills. Samples sent on trial. Kristee 79, Akron, Ohio.

\$1,000.00 A Month for making dramatic 3-second demonstration of amazing lightweight Presto fire extinguisher. New chemical used by Airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd, Dept. P-66G, New York City 16.

I'LL Send you free stocking sample newest advancement in hosiery since discovery of nylon. Patented full-length; stays up without supporters, amazingly comfortable. Nationally advertised price \$1.95. Make money fast introducing to friends at \$1.00 pair. American Mills, Dept. 647, Indianapolis, Indiana.

EARN Big money full or part-time. Quickie Spray shines all leather instantly without buffing, brushing. Be first! Rush refundable \$1.00 for demonstrator, selling kit. Franchises available. James R. Barnett Co., Dept. PM-38, Wellesley Hills 81, Mass.

AGENTS—\$2000 Month. New cigarette machine. Macco, Box 6028-P, Minneapolis 10, Minn.

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\$25 DAY, Easy. New fire extinguisher. Retail \$2.95. Profit \$2.00. Free sales kit. Edconco, 155 East 44th Street, Dept. P3, New York 17, New York.

NEW Invention. \$4.95 fire alarm, paying up to \$1,100 a month. No wiring. Unlimited market. Dramatic demonstration. Free kit. Merlite (Alarm Div.), 114 E. 32nd St., Dept. F-66G, New York 16, N. Y.

SELL "Blind made" ties, household items. All made by blind people. Terrific moneymakers! Blind Workers, 5635-Q Clark, Chicago 40, Illinois.

IMPORTED Rings and bracelets, with anyone's picture completed in our studio. Amazingly low priced. 100% profit. Write Oceanic Importing Co., Dept. PM, Hyde Park National Bank Bldg., Chicago 15, Ill.

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AGENTS: Big profits, full or part time, selling stores, homes and industry. Simple convincing demonstration cinches sales fast. Terrific repeat item used every day by millions. Be first in your area to enjoy success with Magic Tack Cloth. Literature and sample free! Wm. Juergens Mfg. Co., Dept. PM4, Box 143, Sta. C, Toledo, Ohio.

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GOLDMINE Of 600 money makers. Free copy. Specialty Salesman Magazine, Desk 5B, 307 North Michigan, Chicago 1, Ill.

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MY Six 80% money-saving catalogues. Amos Mail Order, Yountville, Calif.

BARGAIN Price catalog. Appliances, books, housewares, watches, jewelry, cookware, tableware, cutlery, etc. Discounts to 80%. Rush \$1.00 deposit refundable. Tony Distributing Co., 135-C So. 13th, San Jose, California.

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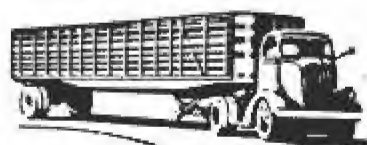
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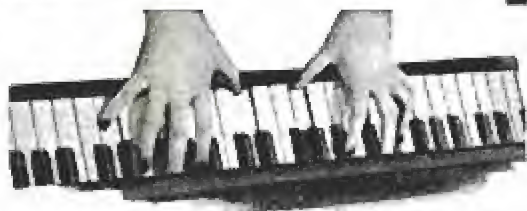
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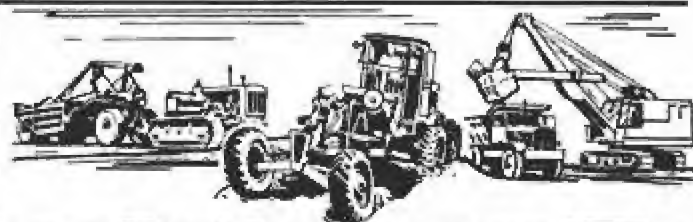
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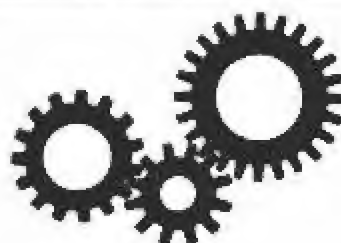


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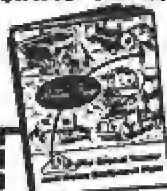
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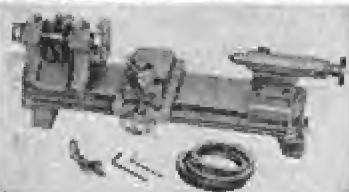
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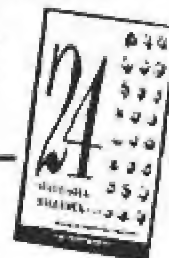
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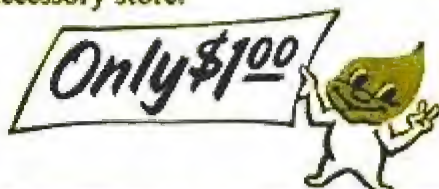
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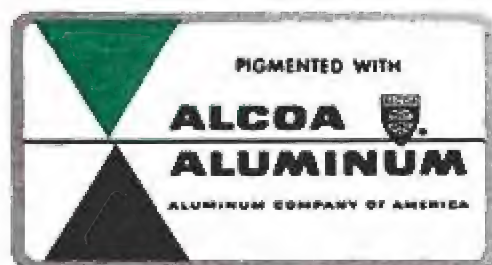
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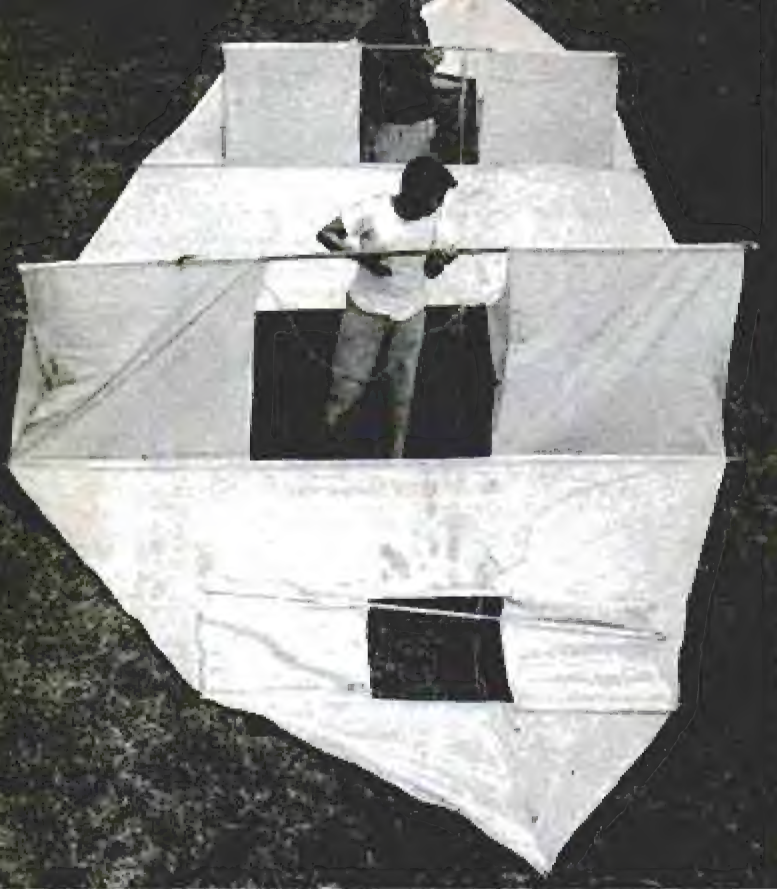
He Flies Kites for Love or Money

By George X. Sand

WHEN Rear Adm. Richard E. Byrd led his Operation Deepfreeze expedition to the Antarctic, the famed explorer knew from experience that very tall low-frequency radio antennas would be required

Developed during war, kite held communication devices 1500 feet in air





Jalbert and son display kite with 18-foot wingspread. The inventor once used it to tow an automobile

to maintain dependable communication with the outside world. The nature of the polar atmosphere was such that it hopelessly attenuated the conventional short-wave signals.

To erect huge, very costly radio masts would require transporting thousands of

tons of steel under very unfavorable circumstances. Once up, such towers would be subject to the violent storms that lash this desolate area.

Instead, Byrd decided to use captive balloons to send aloft the long antennas. However, unlike the unsteady "rubber cow" gas bags used during the last war, these balloons would have to remain practically stationary in the polar sky, regardless of the wind. A big order!

Jalbert Knew the Answer

The Jalbert Aerology Laboratory at Boca Raton, Fla., knew the answer to Byrd's problem. The founder of this unique lab, Domina C. Jalbert, 53, is an energetic French Canadian inventor who has delighted himself by flying kites since he was four. He supplied the Deepfreeze expedition with airfoil "kite balloons" of his own origin that are part kite, part balloon, with the best features of each.

"I'd discovered that an ordinary balloon would remain stationary overhead only if there was little or no wind to blow it and its cable away from the vertical plane," explains Jalbert. "In fact, if the wind blew strongly enough it would force the gas bag right down against the ground.

"On the other hand, to remain aloft and steady, a kite required a fairly strong breeze. Without wind, the kite would dive to earth. So I compromised by putting kitelike fins and rudders on a streamlined balloon. Henceforth, the stronger the wind

Trapped air supports marker which is tossed from a ditched plane or stricken vessel to attract attention



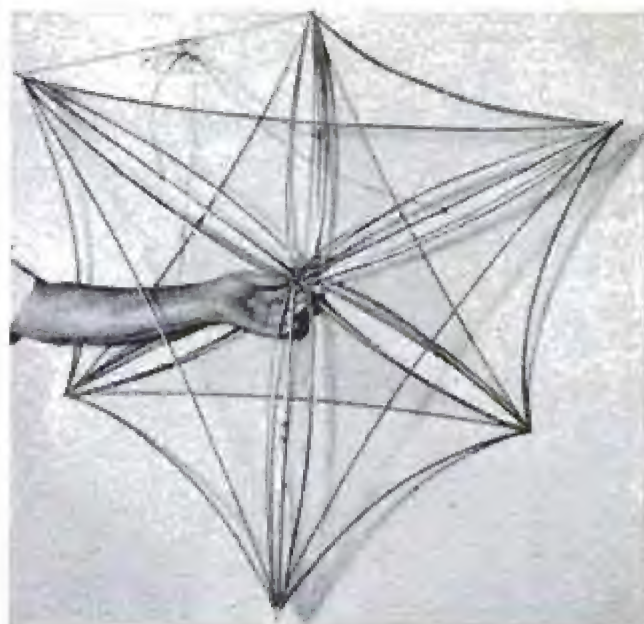
the more the kite-balloon would climb against it. And, of course, with no wind the hydrogen or helium-filled bag would remain up anyway."

Jalbert's measure of a good captive balloon is its ability to remain almost directly overhead, for days if necessary, with practically no movement. His kite-balloons have solved the problems of surveyors in rough terrain by supporting airborne sighting markers for their transits. When the Rockefeller Foundation found itself wondering how it could suspend mosquito traps above the tallest trees of the Brazilian jungle to make possible a study of malaria conditions, Jalbert's invention provided the means.

The unusual product has found application from one end of the earth to the other. Byrd used it in the Antarctic; near the North Pole, Norwegian whaling ships put it to work to mark the location of harpooned leviathans, preventing loss of the floating carcasses.

Several years ago the University of Washington wanted to record on film the activities of spawning salmon in the rivers. However, experience warned that the sound of a boat or plane motor, even the splash of a wading cameraman, would disturb the fish and defeat the purpose. You guessed it: one of Jalbert's kite-balloons was weighted down so that it floated silently over the unsuspecting salmon while an automatic camera made the pictures.

Sometimes when optimum conditions prevail, Jalbert will use a straight kite on his projects instead of the kite-balloon. Once the Woods Hole Oceanographic Institute had him make a kite for measuring



Collapsible radar reflector is stored aboard lifeboat, flown to pinpoint location of drifting boat

the depth of the Caribbean Sea in the vicinity of the Virgin Islands. "Because the southeast trade winds blew steadily in that area the kite easily held up the depth-recording instruments," he says.

He uses Egyptian cotton for the construction of his kites.

"Speaking of kites, I think I hold the world's surf-casting record — 1500 feet," says the inventor with a chuckle. He'd gone fishing for striped bass at Martha's Vineyard, Mass., but the fish insisted upon remaining far offshore. So Dom rigged up a kite to fly his bait out to the stripers where it was released to fall among them.

However, the majority of the clients' letters in the files of Dom's 10,000-square-foot aerology laboratory in Florida deal with the kite-balloon. An Oregon vacation site, located deep in a wooded wilderness, flies a telltale kite-balloon directly overhead. This marker in the sky enables lost tenderfeet to find their way back to camp.

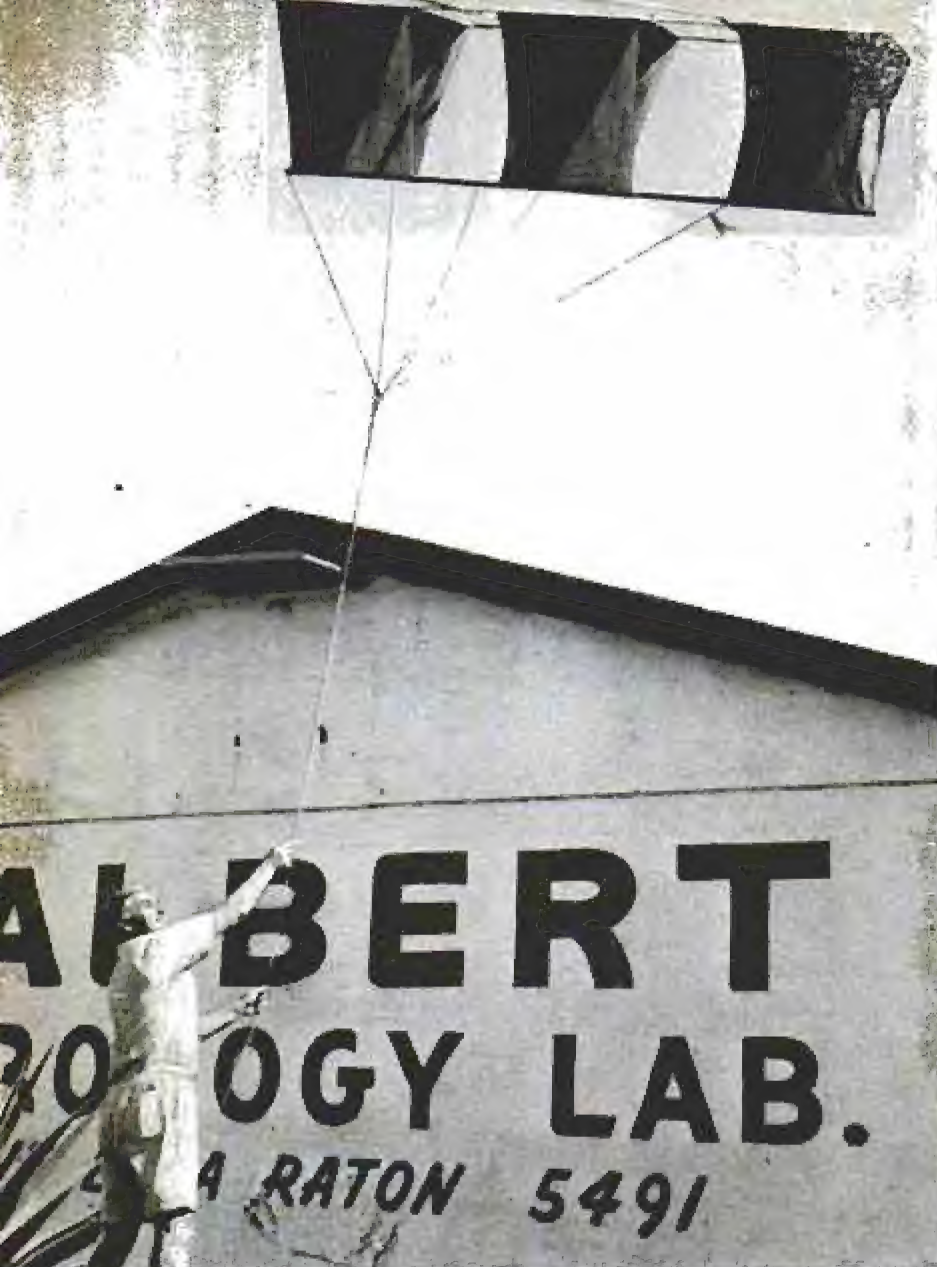
The "sky hooks" are likewise used in everyday life to hold aloft eye-catching signs that promote everything from political campaigns to fund-raising projects, fairs, carnivals and the opening of new business establishments. In Texas, cowboy residents blinked unbelievably when a huge American flag unfurled itself in the sky above a supermarket. High above the flag rode one of Jalbert's kite-balloons.

His most important customer is the U. S. Government. He is a member of the Naval Institute and has been cited by the Navy. Among the classified jobs in which he has taken part are guided-missile and earth-satellite projects.

Domina Jalbert was born in St. Michael, in northern Quebec, the 17th child of a very poor family of 21 children.

Jalbert kite is used to suspend smoke-measuring instrument above chimney in a city's antismog campaign





Kite six feet tall with eight-foot spread was designed to support depth-measuring devices over the surface of the Caribbean

Multicell parachute canopy developed by Jalbert will carry 35 to 40 percent greater load than a conventional parachute



"There was no railroad, no automobiles, nothing," he recalls. "There was very little money to buy clothing, none at all for toys. My mother was constantly remodeling old clothing from one child to fit the next younger.

"I used the leftover rags to make kites to play with. Kites fascinated me. I made all kinds. I even flew them in the rain. What few neighbors we had thought I was crazy."

By the time the boy was 14 his family had moved to Woonsocket, R. I. To help his struggling parents, he quit school at the sixth grade and went to work in the woolen mills. He has had no formal schooling since. Yet this self-taught inventor is often invited to lecture at large universities.

Dom continued to play and experiment with kites at every opportunity. At first puzzled why the same kite would fly perfectly one day, then badly the next, he learned how changing winds, temperatures and other factors could affect the performance of his kites.

He built a kite with an 18-foot wingspread that could tow an automobile. And he stumbled upon the advertising potential of his hobby one day when he flew a political candidate's name above the city for \$15. The man was elected—only member of his party to win.

Meanwhile, young Jalbert had become interested in foot racing, no doubt the result of running fast since childhood to launch his kites. He won several dozen trophies as a sprinter, and became national walking champion in the early '30s.

Although friends continued to ridicule him for "playing" with kites, Jalbert kept on stubbornly. By this time he'd learned that a properly rigged kite could be expected to fly almost directly overhead, with very little drag or bow (catenary) in its line. If the bow was permitted the kite would very likely end up in tree tops.

This catenary was not caused by the weight of the line; rather, by the pressure of the wind against the total area of the string, and the effect of gravity. When this combined pressure overcame the dynamic lift of the kite, down everything would come! (If you computed the area of the line by



Square chute of multicell type is more efficient than round one. With several cells ripped, chute still supports load

taking its diameter — including the “fuzz” of the weave—and multiplied this by the length, you nearly always found you had a square area almost equal to that of the kite surface which was trying to lift it.)

“By the time World War II broke in Europe my years of experimenting with kites and small balloons had taught me the art of precision rigging,” Dom recalls. “It happened that my hobby represented something for which few people had trained themselves. The U. S. Rubber Company made me chief rigger of their barrage-balloon division.”

England was in urgent need of barrage balloons for protection against Nazi dive-bombers. In Dom’s home town of Woonsocket floors and wall partitions were hastily ripped from an idle factory building to provide space for building the cumbersome gas bags. They measured 76 feet long, 28 feet high, and each one upon completion would fill most of a three-story wing of the plant.

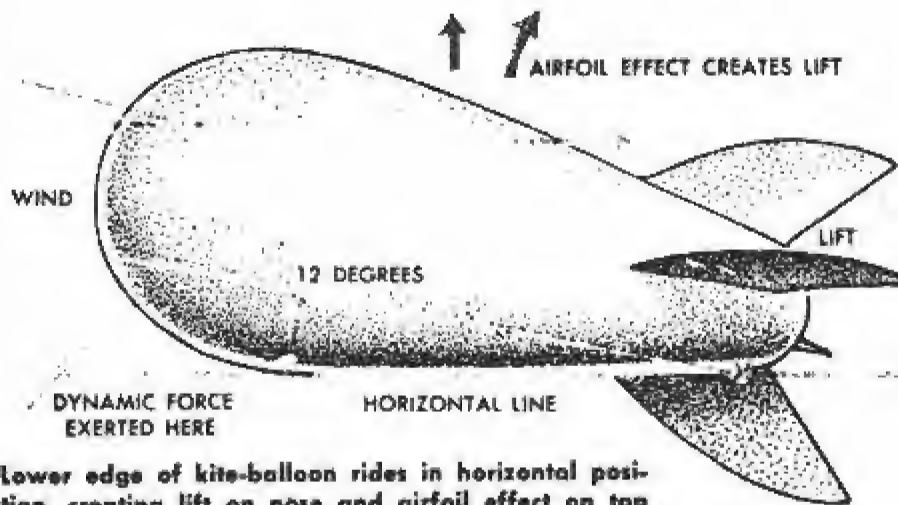
In one 300-foot-long assembly room dozens of girls cut out the more than 100 different patterns that were required, cementing these together on the floor. These employees wore special moccasins to aid the constant battle against dirt. A single piece of grit—should it be overlooked and aggravated later by a violently tossing balloon at several thousand feet—could cut into the cotton fabric like a knife.

Collapsible rubber boats were also manufactured in this U. S. Rubber Company plant. And Dom invented a collapsible kite to be stored inside a small cylinder aboard rubber boats, to serve as a rescue signal for drifting sailors and airmen.

“The Air-Sea Rescue Service wanted other things developed,” he remembers. “I was transferred to the Dewey and Almy Chemical Company at Cambridge, Mass. There I worked with kite-balloons in various scientific fields, traveling extensively throughout the country. I made kites for the Massachusetts Institute of Technology and for the Signal Corps.”

After the war Dom decided to go into business for himself. There was a growing demand for stable balloons that could lift substantial loads. And with Neoprene and new coated fabrics available, the possibilities appeared good. He recalls with a smile the photographer who came to him with the request for “a kite for making aerial pictures.” When the inventor promptly hooked four 12-foot-tall kites in tandem and invited the cameraman to “climb aboard” a makeshift bosun’s chair, the lensman paled. He hurriedly explained it was only his camera he’d intended to fly. Dom’s 12-year-old daughter obliged, instead, by going nonchalantly aloft in her father’s husky rig to take the pictures.

Today the Aerology Laboratory provides standard models of airfoil kite-balloons



Lower edge of kite-balloon rides in horizontal position, creating lift on nose and airfoil effect on top

that meet most of the requirements of customers. Other types are available on order. The standard jobs vary in length from 16 to 30 feet, in diameters from 7½ to 12 feet, and will lift gross weights from 22 to 122 pounds, depending upon whether helium or hydrogen is used.

Jalbert is convinced that kite-balloons would be put to much greater use today had not much of his work been of a secret nature for the government.

"As a result, when you say 'balloon' today the public immediately visualizes the clumsy, old-fashioned barrage type," he says. "This is like comparing a modern car with a Model T!"

He explains the general operation of his own streamlined units thus: "The belly or bottom rides in the horizontal position. From the diameter of the nose to that of the tail you have a 12-degree 'angle of attack.' The wind shifts slightly below the nose and creates a lift, going over the top of an airfoil that provides a vacuum and lifts the balloon straight up."

Fortunately, the operators of an Ohio radio broadcasting station do not share the general public apathy concerning balloons. When a tornado hurled their steel tower to earth they phoned Jalbert to rush a kite-balloon by air. They got it next day and resumed broadcasting with a temporary antenna.

"To their surprise, they discovered they had a 50 percent greater coverage," says Jalbert. "There apparently was less grounding effect caused by the wire that replaced the tower."

In 1950 Domina Jalbert used one of his "sky anchors" to demonstrate a technique which has since revolutionized air-pollution studies. Assisted by engineers at the Columbus, Ohio, Battelle Memorial Institute, he sent aloft instruments to gather samples of gases and solid particles which pollute the air. These were collected in bottles and piped down a small rubber tube to the ground by a vacuum process.

In addition, battery-powered instruments simultaneously recorded the velocity and direction of the wind, humidity, air temperature and other weather factors.

Dom demonstrated how the kite-balloon could be used to suspend the recording gadgets in the center of gases being emitted from a factory smokestack, or fly them high above the city. Such scientific sleuthing served

a double purpose: the guilty factory operators were usually happy to cooperate by trapping the sulphur and other smog-causing waste products at the source, since to do so would represent a substantial saving for them, while helping to cleanse the city's air.

In much the same manner Dom has assisted medical researchers in making pollen counts. And his kite-balloons have been planted in the path of tornadoes to record storm turbulence and other data. More recently, the tough gas-filled kites have felt the concussion of atomic blasts in the desert.

When a customer comes to Dom he is asked three questions: (1) How high above sea level the kite will be expected to fly; (2) how much weight must be carried; (3) the duration of the flight, and under what conditions.

The energetic inventor does not limit his experimenting to kites and balloons. He flies his own plane and is a consultant for the Advisory Committee on Weather Control, a group authorized by Congress to evaluate public and private experiments in "cloud seeding." In an experiment not long ago over the Jalbert Aerology Laboratory in Florida meteorologists released plumes of silver-iodide "smoke" from propane and oxygen-fed generators. Bright yellow balloons were simultaneously released with the vapor so that 16-mm. "time lapse" cameras could track the minute particles as upper air currents carried them into cloud banks to set up the desired reaction.

In fact, anything that involves the controlling of air, gas or liquid will fire Jalbert's inventive imagination. Many airplanes and vessels have disappeared without a trace during recent years in the tropic oceans that wash the Florida shores. Thinking about one disaster, Jalbert found himself designing a self-inflating sea marker which can be tossed out by a ditching plane

(Continued to page 248)



Army Tests Portable Radio Station With "Balloon" Antenna

Capable of being packed into two metal huts and carried by transport aircraft, an Army radio terminal being tested in Arizona has an antenna that inflates like a

balloon. The plastic-fabric antenna, inflated in 12 minutes by a motor-driven blower, is a key to the portability of the unit. It reduces the weight by nearly 1000 pounds.



Swedish Tank Killer

Being tested by the Swedish army is a new nine-centimeter antitank gun. The long-range, recoilless rifle is reported to be equivalent to a 90-millimeter gun. The weapon weighs only 176 pounds, when removed from its two-wheeled carriage. Its light weight and power are expected to make the tank killer an important weapon in Sweden's arsenal.

Tank Pushes Steel Roller to Explode Land Mines in Its Path

Armored units can move quickly through mine fields with the help of a mine-exploding roller that travels in front of a tank. The high-strength steel roller consists of a series of 12 wheels, four feet in diameter and mounted on independent axles.

☛ Fly ash from British electric power plants is being used to increase clover and grass crops as a soil additive, to stabilize soil-cement roads, and to make bricks of 20 percent clay and 80 percent ash.



SPACE- DOWN TO EARTH

By Willy Ley



FEW JOURNALISTS can write with the authority of Dr. Willy Ley concerning the conquest of space. One of the founders of the German Rocket Society in 1927, Dr. Ley has written hundreds of magazine articles and nearly a dozen authoritative books, two of which have become classics in this field—*The Conquest of Space and Rockets*, *Missiles, and Space Travel*. Starting with this issue, Dr. Ley periodically will discuss space research for *Popular Mechanics* readers.

THE WEIGHT OF SPUTNIK NO. 1. There has been considerable wailing by both amateur and professional hand-wringers over what these people choose to consider Russia's big lead in the missile and satellite field. No one can deny that Russia fired some big rockets and placed satellites into orbit. But there's been a deluge of poppycock about "miraculous" scientific advances that enabled them to do it. Much of this analysis reflects ignorance about rocketry. Let's consider just a few of the hard facts that the gloommongers overlook.

A little calculating sometimes can go a long way, even if it doesn't do much except lay a few rumors to rest. The planned American Vanguard satellite is to weigh 22 pounds and Sputnik No. 1 appeared in the sky with the relatively enormous weight of 184 pounds. But these two figures are literally only half of the story. The other half is in the take-off weights of the satellite-carrying rockets. The Vanguard rocket has a take-off weight of 22,000 pounds in round figures. The Russian satellite was fired with the aid of a T-2 Intermediate Range Ballistic Missile with a take-off weight of 85 metric tons. This is roughly 85,000 kilograms or 187,000 lbs. Sputnik No. 1 weighs 83.6 kilograms. Com-

pare the two figures and you'll see that in both cases the ratio between the take-off weight and the "useful payload" for the orbit is very nearly 1000 to 1.

This proves, incidentally, that the Russians did not use a "secret fuel," a fuel unknown to Western scientists. The Russians themselves say that their fuel is a highly refined kerosene burned with liquid oxygen. The 1000-to-1 weight ratio shows this to be true. They used a well-known fuel, but lots of it per second in an enormous rocket.

☆ ☆ ☆

THE SCIENTIFIC VALUE of a shot to the moon. It is practically certain that sometime during 1958 either the Russians or we, and most likely both, are going to shoot a rocket to the moon. Such a shot is the next spectacular event which is within reach of existing rockets. That it is not much more difficult than putting something into an orbit can be deduced from the simple fact that making something orbit requires a rocket velocity of five miles per second while the shot to the moon will require seven miles per second. This velocity can be reached by the top stage of a four-stage

(Continued to page 264)

First U.S. Satellite

Sixteen powerful rockets were used to push the first U.S. satellite into orbit on Jan. 31. The first stage was a huge Redstone missile which normally has a range of about 200 miles. The second stage consisted of 11 special solid-propellant, 50-pound rockets. Three more rockets of this type formed the third stage, and atop the assembly was the final and "payoff" stage—a single rocket attached to the 40-inch cylindrical satellite.

In its long orbit the satellite swings out as far as 1700 miles from the earth, and comes as close as 200 miles in its nearest approach. Its speed is 18,000 miles per hour.

One little-understood feature of the satellite is its attitude or "posture" in space. It neither tumbles nor moves continually headfirst. To illustrate, hold a pencil in your thumb and forefinger and move it in a circle through the air, always keeping the pencil parallel to the floor. As the pencil "orbits" it will move headfirst, tailfirst and sideways.

Edsel Power, Handling Are Tops, Say Owners

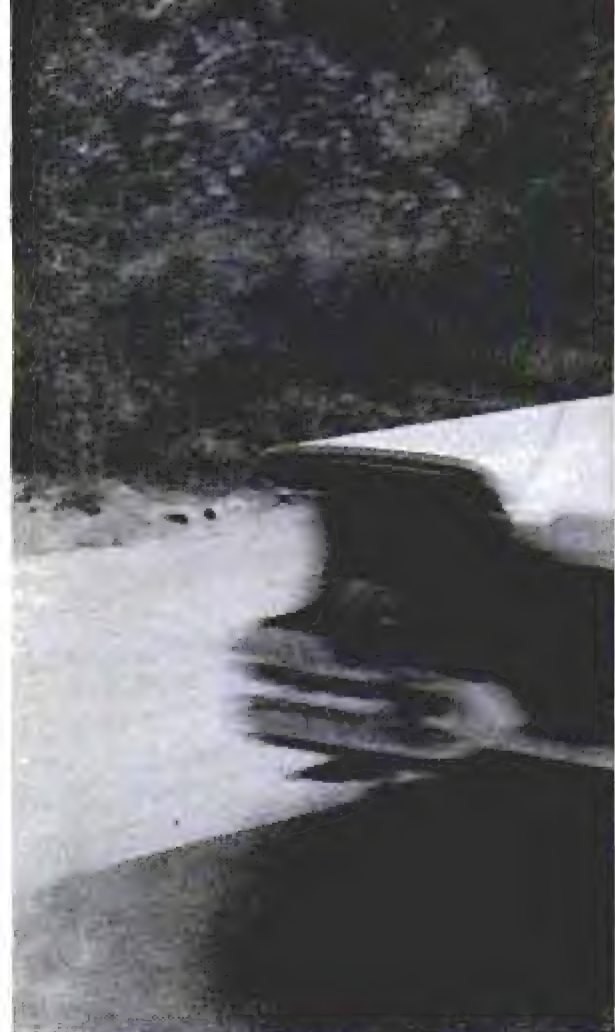
HOW GOOD is the Edsel? What do Edsel owners have to say about this newest member of the Ford family of cars?

Popular Mechanics asked 1000 Edsel owners to tell you what they think about the car. This article is their story.

Marginal comments are by Art Railton, *PM*'s Automotive Editor, and are based on his test of an Edsel Pacer two-door hardtop.

Also included in the marginal notations are pertinent extracts from Dale Kelly's expert engineering analysis of the Edsel Citation four-door hardtop. Kelly's complete test report appears on page 94.

By this thorough coverage, *PM* will bring you the full story of each car it tests in this regular monthly feature to help you decide which car is best for you.



Kelly's best 0-to-60 average was 10 seconds, not spectacular, but plenty adequate.

Handling is very easy, but it is a bit too much for the wheel-to-steering ratio is too slow.

Riding is outstanding in spots, but too soft for some. This is a very comfortable ride.

PERFORMANCE is the feature Edsel owners like best, but close behind comes ease of handling. Almost half of the owners in the *PM* survey ranked one of these two items on the best-liked list.

"I like its **quick getaway**. It does 120 miles per hour (on the speedometer) easily. Its best cruising speed is 90 miles per hour."—Illinois owner.

"It has the power to get around traffic. Plenty of speed. I have had six new cars in the last two years and this Edsel has them all beat in performance." — Indiana automobile-plant employee.

"I drove from Virginia to the West Coast averaging 850 miles a day. I have never driven a car with the **handling ease** of the Edsel."—Washington serviceman.

"It seems to fit me and this makes it an easy car to handle."—Connecticut carpenter.

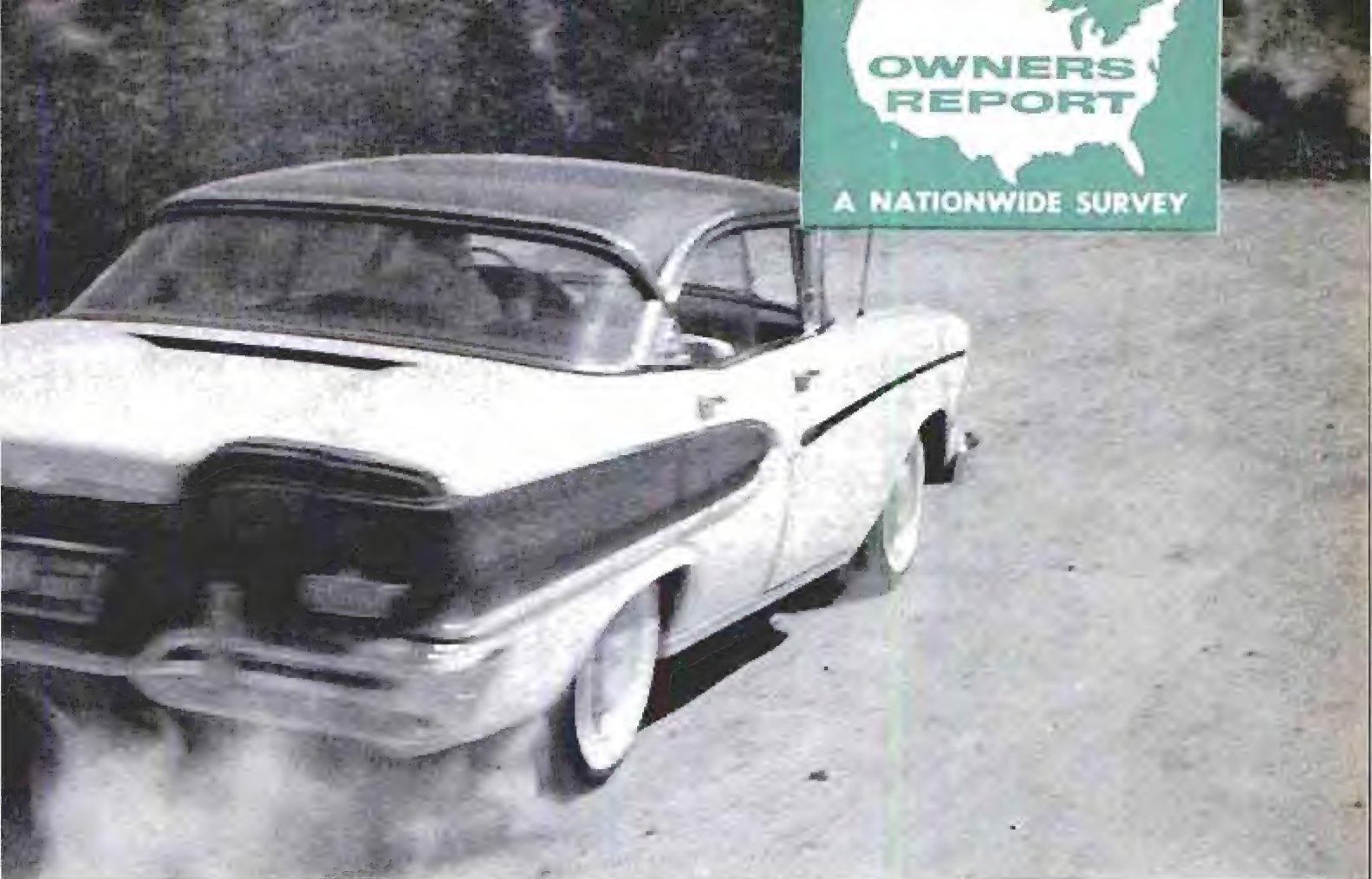
Third on the list of best-liked features is riding comfort with 33 percent of the owners mentioning it. Right behind it, with 31 percent, is exterior styling.

"We drove to Canada and hit some pretty bad roads on the way up. My wife was asleep in the back seat and on one of the roughest stretches of detour she didn't even wake up. This is a truly **smooth-riding** car. She even put polish on her nails in the back seat with no smears."—Texas drug salesman.

"I can say they took the driver into consideration in designing this car. He is at ease all the time."—Illinois automobile mechanic.

"Lots of station wagons ride very rough. But this Edsel wagon has a smooth, comfortable ride."—Pennsylvania self-employed owner.

"Best-riding car I've ever been in. Has heavy car comfort, light car get-up-and-go."—Maryland salesman.



"I like the clean cut of the Edsel. It really looks sharp."—Michigan salesman.

"I like the body style most. It is so different from any other car."—Oklahoma tile layer.

"Styling is prettiest in the industry. I am glad it does not have big, ugly tailfins. I would not have bought it if it had."—Kentucky oil-company employee.

And They Complain, Too

More than a third (36.3 percent) of the Edsel owners have no complaints at all about their cars. In fact, there is only one complaint that can be described as frequently mentioned. It is **poor workmanship** in assembly which results in many trips to the garage for service. Slightly more than 16 percent of the owners list this fault. Some of their criticism is serious.

"This car has been in the repair shop almost every other day. The exhaust pipes rattled. The tachometer clicked. The heater did not work. The electric shift did not work properly. Rear windows do not go up and down easily (it's a convertible)."—New York owner.

"Workmanship very poor, the welding especially. After I paid for the car, the dealer took me aside and said, 'We want you to know, we only sell this car, we do not make it.'"—New York procurement representative.

"Dealer replaced at no cost to me the following parts: Automatic transmission, rear-end assembly, three windshields, speedometer."—Indiana television engineer.

"Took a 1600-mile trip. When I reached home only the motor and cigarette lighter were working. Power steering went out, radio dial jammed, vent motor failed with vents open, shift buttons failed at times."—Alabama owner.

The most frequently mentioned of the specific complaints

One man's meat is another man's poison, and vice versa. That's the story of styling.

Faults like these don't show up in the usual road tests. Here the true value of the Owners' Report shows up. We are testing not just one car, but hundreds of cars with the help of owners from coast to coast.

The calculated risks of mechanical servants. None of these failures would have occurred with old-fashioned manual controls.



Edsel owners don't agree about the attractiveness of the grille, but all seem to agree that it's distinctive

No complaint of this on the test car.

Test car did ping slightly on hard pulls, but super-premium gas was not used, only straight premium.

Although it was a hardtop, the test car developed no squeaks or rattles during the 500-mile test.

Kelly's report shows that about 12 miles per gallon is all you can expect from the Edsel Citation for all-around driving.

deal with power-steering trouble, the engine, dealer service, body noises, poor gas mileage (a perennial complaint of new-car owners) and sloppy paint job. Here are some of the things the owners say on these subjects:

♦ **"Power steering groans on sharp turns. The belts have been adjusted but it still groans."**—Ohio osteopath.

"Steering not up to par. There's a rattle in the hub of the steering wheel too."—New York factory worker.

♦ **"Engine appears to be building up carbon. Knocks in spite of spark adjustment. It may be that a big engine will have this trouble as it is rarely possible to operate it at any more than a small part of its power."**—Washington salesman.

"Noisy engine from the start. Rod bearings loose and replaced at 3000 miles. Knocking again at 6050 miles."—Wisconsin supervisor.

"Service is bad. I blame the factory. The people who service the car just don't know how to do so. They say they spent 250 million, they should have spent a couple of million more teaching service managers how to service the car before it was put on the market."—Pennsylvania inspector.

♦ **"Too many squeaks and rattles."**—Wisconsin owner.

"Carburetor not adjusted right. Uses a lot of gas. About 10 miles per gallon."—Massachusetts pharmacist.

"Have to use super fuel. When spark is retarded to eliminate knock, power and economy disappear. Dropped from 16 down to 13 miles per gallon."—New York salesman.

♦ **"Poor paint job. Dealer has repainted it twice. Worst paint job I ever saw on a new car."**—Montana druggist.

"Painting job is the worst I have ever seen. The fabric on the ceiling is a lousy job also. It is full of wrinkles."—Ohio painter and decorator.

What Make Traded?

Since all Edsel sales are conquest sales (the term used in the industry to describe a change from one make to another), it is interesting to see what makes were traded.

As you might expect, more Fords were traded in on Edsels



HERE'S \$918 IN EXTRA-COST ACCESSORIES

You can put a lot of money into the dash—most everything costs extra. Cheapest item is \$2 glovebox light

than any other make, with Mercury coming in second, just a fraction of a percentage point above Chevrolet. Here are the percentages: **Ford 32.8 percent; Mercury 11.7 percent; Chevrolet 11.5 percent; Buick 7.4 percent; Pontiac 6.8 percent.**

Asked what make they will buy next time, the Edsel owners show an average amount of loyalty. Just about half (51.6 percent) say they will buy another Edsel. About 30 percent are undecided or do not answer. Of those who plan to buy some other make, the one most likely to be bought is Ford with 4.1 percent. Chevrolet is next with 3.3 percent, then Oldsmobile, Buick and Chrysler with 1.4 percent each. There is little evidence that the Edsel buyers are going to trade up in the Ford family as a mere 0.8 percent said they planned to buy Mercury next.

What About That Grille?

The survey made clear that there is plenty of controversy about the **oval-shaped Edsel grille**, even among owners. When asked to name the exterior styling feature they like most, the owners rank the grille at the top of the best-liked list with 19.7 percent. When you add others who mentioned the "front end" as the thing they like best, the number totals a big 36.6 percent.

But the next question asks owners to name the exterior styling feature they like least. Once again, the grille gets top honors as 9.0 percent list it. When the "front end" answers are added, the total is 13.4 percent.

"At first people couldn't get used to the grille. In fact, they didn't like it, but as time goes on they are liking it more."—South Dakota hatchery operator.

"I like the front end because it is **entirely different** from any other. I advise the other companies to break up the straight hood like Edsel has done. It's beautiful."—California salesman.

"The front end looks too heavy and bulky."—Texas oil-company worker.

* Includes:
Speed warning light
Parking-brake light
Fuel-level light
Oil-level light
Open-door light

** Includes:
Rear-view mirror
Backup light
Engine-compartment light
Nonglare inside mirror
Trunk light

Trouble here is that most Edsel sales seem to be coming from people who might have bought Fords or Mercurys—that's no way to increase business.

You either like or dislike the vertical grille—there is no middle ground. If they had to do it over, Edsel stylists probably would have "jazzed" up the front end more—the public seems to like jazz.

Agree. It is good that at least one company is trying to be different. There are too many look-alikes in this business—and even more "be-alikes" under the sheet metal.



1958 EDSEL TEST DATA

MODEL TESTED: 1958 Edsel Citation four-door hardtop with four-barrel carburetor, single exhaust, automatic transmission, power brakes and linkage-type power steering.

Rear-axle ratio: 2.91 to 1. Wheelbase: 124 inches. Tires: 8.50 by 14. Weight: 4440 pounds with gas tank half full (56 percent on the front wheels, 44 percent on the rear).

Mileage on car at time of test: 4500 miles. Barometer: 29.52 inches. Temperature: 53 degrees F. Payload: 200 pounds.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Regular gasoline.....	2.8	6.4	11.0	17.2	18.2
Premium gasoline.....	2.6	6.1	10.2	15.9	17.6
Super-premium gasoline.....	2.6	6.1	10.0	15.5	17.4

(All tests in Drive range. Gasoline had the following octane ratings by Research method: Regular 90; Premium 97, Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	17.15	14.65	12.1	8.5
Premium gasoline.....	17.5	15.2	12.5	8.3

(In traffic test car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

Estimated average

ANNUAL GASOLINE BILL: \$245 for 10,000 miles

(Based on exclusive use of premium gas at 33 cents a gallon.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading.....	20	30	40	50	60	70	80
True speed.....	21	31	41	51	61	71	81

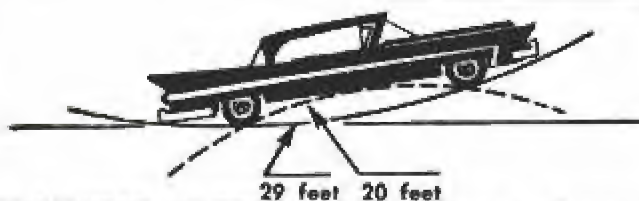
ODOMETER ERROR (miles traveled)

Odometer registered 91 miles for an actual distance of 100 miles (see below).



DRIVER'S VISION

Driver could see part of road 20 feet in front of car, full width of road 29 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....29-ft. radius
Worst hump that could be crossed.....20-ft. radius
Deepest rut that could be negotiated.....7.5 in.
Curb clearance for door opening.....12 in.

MISCELLANEOUS

STEERING

Steering-wheel turns for 100-ft. circle 1.05 turns
Curb-to-curb turn-circle diameter.....43.5 feet
Wall-to-wall turn-circle diameter.....46.0 feet
Steering-wheel turns, lock-to-lock.....5.0 turns

CENTER OF GRAVITY: 23 inches

TRUNK CAPACITY

14 cartons (one cubic foot each)

WATER RESISTANCE (see Observations)

Splash-pan test: No leaks. Ignition not affected.
Brakes slightly uneven a short time after test.
High-pressure test: Very slight leaks in passenger compartment and in trunk.

OBSERVATIONS

During a heavy rain, the trunk leaked badly and, because the drain hole in the spare-tire well was plugged with undercoating, the well filled with water and overflowed.

In place of a water-temperature indicator there are two warning lights. One (a red light) comes on when the temperature reaches 233 degrees F. the other (green) stays on until the temperature reaches 115 degrees. This range (from 115 to 233 degrees) is far too wide to ensure good engine performance. These lights, as well as the oil-pressure and generator-charge lights, are located very low on the instrument panel where they are partly obscured by the steering wheel.

The brightness control for the instrument-panel lights is separate from the headlight switch.

It is not labeled and is obscurely located under the instrument panel.

The steering wheel requires far too much "winding" to negotiate a given curve.

If battery goes dead with pushbutton transmission control in Park, the car cannot be pushed as the transmission cannot be taken out of Park when no electricity is available.

The unusual odometer error (showing fewer miles than actually traveled) appears to be due to an assembly-line blunder in the selection of speedometer gears. Another Edsel was tested and found to register a more usual 102 miles for every 100 miles traveled. Had the test car been so geared, it would have had the usual optimistic speedometer also.

"Don't like the horse collar in front, but I don't see it when I'm driving."—New York pipe fitter.

"The oval-shaped grille is extended too high to be attractive."—Ohio polisher.

"They should improve the grille although it is distinctive."—Minnesota contractor.

More Best-Liked Features

Here, in order of frequency of mention, are more best-liked features listed by Edsel owners (for the exact percentages see table on page 95):

"I love the **handy push-button shift** on the steering wheel. It's the most handy one yet."—Ohio owner.

"Push buttons very good. Being able to shift with either hand is helpful."—Wisconsin minister.

"By using my thumb to shift, I can keep both hands on the wheel."—Colorado salesman.

"Fastest shift and handiest."—Vermont salesman.

"Solid feel. Makes me feel safe in turns at 75 miles per hour."—Georgia salesman.

"Substantial, secure feeling at 90 miles per hour."—Illinois tool designer.

"It has a **big-car feeling**."—South Dakota owner.

"Visibility. The large rear window gives more vision to the rear."—Massachusetts typist.

"My wife says it is the only car in which she is able to see the right front fender while behind the wheel. She is only five feet tall."—Massachusetts foreman.

"Enormous reserve power."—Illinois executive.

"Seats support back and shoulders. Passengers always comment favorably."—Missouri executive.

"Much more comfortable having the smaller part of the split front seat behind the driver."—Illinois saw man.

"I like the convenient controls: the flip switches on the panel, the heater control."—Illinois owner.

"Large trunk area."—New York maintenance man.

"I'm a rural letter carrier with 300 boxes on a route of 45 miles. I average 11 to 12 miles per gallon, which I think

(Continued to page 276)

*Disagree. The wheel-
and push buttons seem
less convenient than
the old lever. And
the light behind them is
much too bright.*

HERE'S A SUMMARY OF THE EDSSEL OWNERS' OPINIONS:

OVER-ALL RATING: **Excellent 72.9%** **Average 21.6%** **Poor 5.5%**

Best-Liked Features

Performance, acceleration	48.6%
Ease of handling	47.5%
Riding comfort	33.3%
Exterior styling	30.9%
Push-button transmission	13.4%
Roadability	13.1%
Big-car feel	6.8%

Most-frequent complaints

None at all	36.3%
Poor workmanship	16.1%
Power-steering trouble	7.9%
Noisy engine	
engine trouble	7.7%
Dealer service poor	7.1%
Body noises	6.8%
Poor gas mileage	6.6%
Poor paint job	6.0%

Best-liked styling feature?

Grille	19.7%
Front end	16.9%
Rear-end design	13.9%
Taillights	11.7%

Least-liked styling feature?

Grille	9.0%
Front end	4.4%
Taillights	2.2%
Rear end	1.9%

Had trouble with engine?

No trouble	69.7%
Some trouble	24.6%
Considerable trouble	5.7%

What was engine trouble?

Carburetor, auto choke	9.9%
Valves	5.5%
Oil leaks	5.2%
Knock, ping	3.0%
Generator trouble	1.6%

How is dealer service?

Excellent	59.9%
Average	28.3%
Poor	11.8%

Would buy from him again?

Yes, would	58.2%
No answer, undecided	29.2%
No, would not	12.6%

What car did dealer sell before?

Ford Motor Co. car	30.2%
Studebaker-Packard	23.5%

Chrysler Corp. car	14.7%
General Motors car	14.3%
Other	17.3%

What make was traded?

Ford	32.8%
Mercury	11.7%
Chevrolet	11.5%
Buick	7.4%
Pontiac	6.8%
Oldsmobile	6.3%
Plymouth	4.4%
Packard	3.6%
Studebaker	2.5%
All others	11.1%
No trade, no answer	4.4%

What make will buy next time?

Edsel	51.6%
Ford	3.3%
Chevrolet	1.4%
Oldsmobile	1.4%
Chrysler	1.4%
No answer, don't know	27.6%
All others	13.3%

Approve industry style trends?

Yes, approve	77.8%
No, do not approve	14.5%
No answer	7.7%



Electronic Cashier Changes Dollar Bill

Slip a one-dollar bill into a slot in a robot cashier and, in three seconds, you'll receive four nickels, three dimes and two quarters. The inventor, William A. Patzer of Chicago, says the device can be adapted to give other change combinations—from two half dollars to 100 pennies. It also can be modified to accept currency of other denominations. The one-dollar-bill changer will reject other denominations, fake or foreign currency.



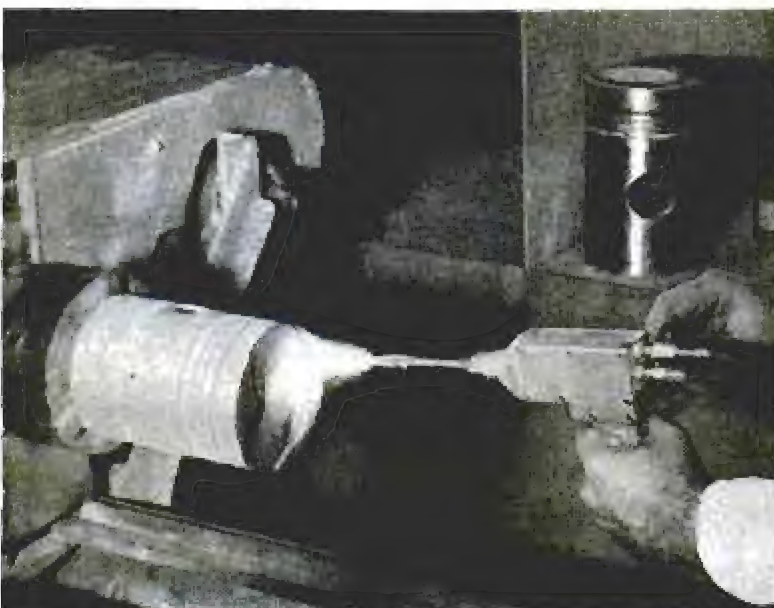
JATO Snooper Missile Has Changeable Nose

External design of the Army's new SD-3 surveillance drone is revealed by a model of the new missile. Republic Aviation Corporation has started production of the pilotless craft for the Signal Corps. The drone has interchangeable nose units which make it possible to change the drone quickly from one type of surveillance sensory device to another. The drone can be launched in short space by using jet-assisted-take-off equipment and it is recoverable.



Weatherproof Shelter Built at Low Cost

Geodesic-dome principles are used in construction of a new kind of weatherproof shelter that costs about 50 cents per square foot of floor area. A slat frame of 1 by 4s, bolted in a series of triangles, is fastened to a base ring. Nailed to the frame are eight-foot squares of insulating board.



Auto-Piston Coating Cuts Exhaust Problems

Ceramic scientists at Armour Research Foundation have developed a coating for piston heads which may eliminate some of the problems of auto-engine exhaust. The flame-sprayable coating contains rare-earth oxides that act as a catalyst in internal-combustion engines. The scientists found the coating reduced the amount of carbon monoxide and unburned carbon in auto engines during acceleration and deceleration. The coating, however, seemed to have little effect under idling conditions or at high cruising speeds.

Look at Moon To Study Earth

Does the earth change colors during different seasons, like the planet Mars? Dr. Andre Danjon, French astronomer, has developed an "earth shine" measuring scope which may answer the question. The instrument will analyze light from the earth as it is reflected from the moon's dark side.



French Jet Copter To Be Built in U.S.

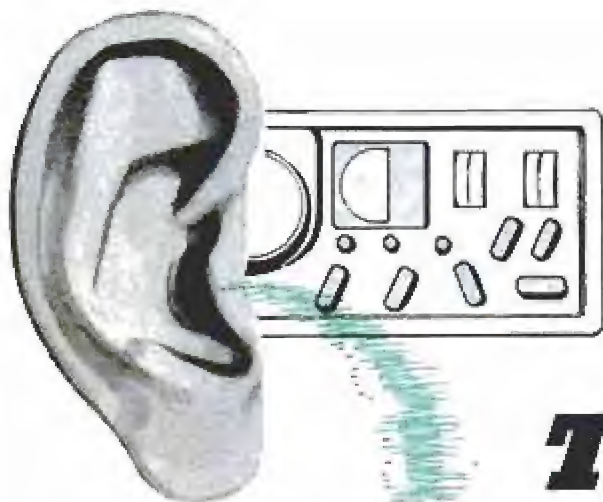
Alouette II, French-designed jet helicopter which set an altitude record of 29,931 feet, will be marketed in the United States. Republic Aviation also has a licensing agreement for eventual manufacture of the five-place copter. It's powered by an Artouse gas-turbine engine which allows take-off without a long warm-up. Maintenance time reportedly is one eighth that of other copters.



Polaroid Copy Stand For Small Objects

Photographing charts, maps, titles and small objects with a Polaroid Land camera is simplified with a new copying unit. The unit includes a camera stand, easel, timer and lights. The item to be photographed is placed on the cork easel, the fluorescent lights at the side are turned on, the timer is started and the exposure is made. The timer also can be used to time development of the picture. The 11-by-14-inch cork surface is marked off in eight sizes to conform to the shape of the film used in the camera. The fields on the easel show exactly what will appear in the picture with the camera at various heights.





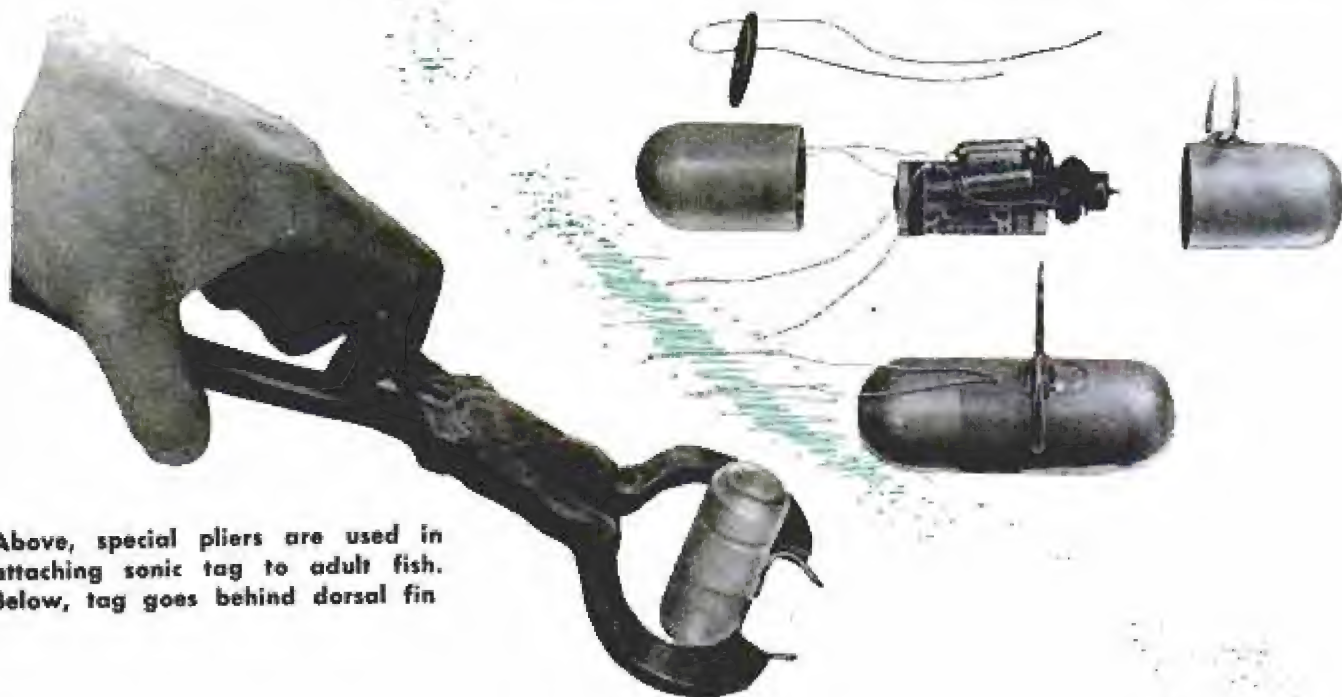
Electronic "Ears" Track Salmon

By Howard E. Jackson

After sonic "fish tag," below right, is assembled it is dipped in waterproofing plastic solution. Crystal transducer at left is inserted in left half of capsule

ULTRASONIC TRACKING and ranging equipment has been developed for the U. S. Fish and Wildlife Service station at Seattle, Wash., to obtain information on adult salmon behavior in relation to Columbia River dams. The equipment reveals behavior patterns of salmon at fishway entrances and exits, near spillways and powerhouse sections.

It consists of a miniature underwater, ultrasonic transducer or sonic "fish tag," and a self-positioning



Above, special pliers are used in attaching sonic tag to adult fish. Below, tag goes behind dorsal fin



directional, echo-ranging-receiving system. After the tag is attached to a fish, the transmitted sound waves are picked up by receiving equipment on a boat. Since the receiver is calibrated in bearing, distance and angle in relation to the sonic tag, the position of the fish can be pin-pointed and its detailed movements readily plotted.

The tag is attached behind the dorsal fin of the salmon by a "hog ring" while the fish is underwater in a trap. The fish is not handled nor is it immobilized.

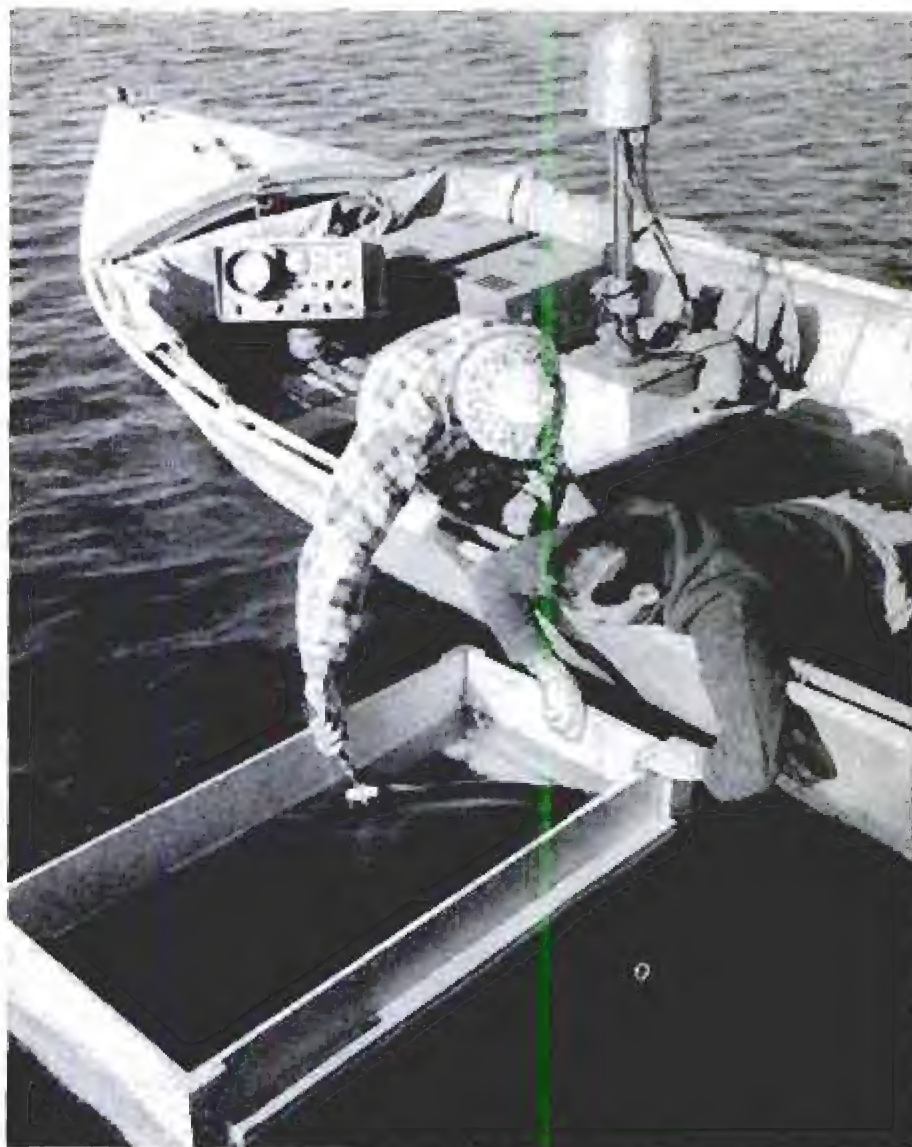
The transducer is an aluminum capsule $2\frac{3}{8}$ inches long, weighing approximately 2 grams immersed. The 15-volt battery and the electronic circuits are embedded in plastic foam. The transistor is in one end, the resonating crystal in the other. The "hog ring" is soldered to the capsule.

In quiet, fresh water the sound waves can be detected up to 2000 feet. In turbulent water the distance is reduced to 65 feet. The distances in sea water are reduced by one third. Depending upon the size of the battery, the sound waves can be detected from 10 to 100 hours. Even though the fish can be detected at distances up to 2000 feet, the maximum radius within which the fish can be "tracked" is 800 feet.

The transducers' repetition rates are adjustable, allowing several tags to be used at the same time, in the same area. The position of up to 10 tags can be pin-pointed and identified with equipment that can be tuned to a desired frequency.

The automatic-tracking device "homes" on the tag and aims the echo-ranging system, which tells the movements of the tag by sending ultrasonic impulses into the water. Echoes from the fish tell its position through an indicator unit. The frequency of the sound impulses differs from that of the sonic tag, precluding interference.

The indicator unit has a viewing screen, a tilt-angle meter, a loudspeaker and a signal-level indicator, plus the operating controls. The screen, a calibrated cathode-ray



Salmon are tagged in 30 seconds inside a trap. Tag is attached by a "hog ring." Aboard boat is automatic sonic tracking-ranging receiver

tube, shows the echoes as a bright spot of light after conversion into electrical energy; the bearing and distance of the fish can be read directly. The meter shows the angle at which the sound impulses are projected into the water. With this information the depth of the fish can be calculated. The loudspeaker produces signals that help interpret the returning echoes, and the signal-level indicator show the strength of sound waves being transmitted by the tag and indicates the distance of the fish from the echo-ranging system.

Although this equipment was developed by Minneapolis-Honeywell Regulator Company to provide data on adult salmon movements relative to dams, it can also supply information on the movements of other adult fish and aquatic animals under natural conditions. ★ ★ ★

◀ Natsyn, a new type synthetic rubber that has the molecular structure and performance characteristics of the natural, tree-grown product, has moved from laboratory scale to a tonnage-basis production.



DETROIT LISTENING POST

By Art Railton

THE GIANTS AWAKEN. As sales of imported cars soar and domestic-car sales sag, the industry begins to move.

The big companies are involved in the race of the decade—the race for the first American small car (disregarding the Rambler American which is now being built at the rate of 40,000 a year).

As you would expect, denials are strong. The companies claim to be no more serious about the small car now than they were two years ago.

Ford has told its big boys to stop making statements on the subject. When this happens, look out. Everybody's happy to talk about the distant future, but nobody wants to talk about next year.

The small-car target is 1960, with hopes of hitting 1959. Mark it down on your calendar.

Detroit versions of the small car will range from 102 to 106-inch wheelbases. They must be a little bigger, a little more luxurious and more comfortable than the European versions.

Chevrolet seems to be ahead in the race right now, although Ford is close behind. Guesses are that designs will be conventional, sort of scaled-down American cars. This, if true, is disappointing to those who have been hoping for refreshing ideas.

Chrysler Corporation is apparently still uncertain on this subject. It might have to settle for selling a European-built car.

What Happened to Turbines?

All the noise about small cars drowns out any talk about turbines — the much-discussed "engine of tomorrow" only a few years ago. But Chrysler continues to keep over 100 engineers on the project. There must be a future in it, that's a lot of money to invest.

Advocates say turbines will be for sale in seven years. Problems of economy and metallurgy have been licked. Even the durability angle is solved.

Of course, piston-engine men quietly laugh at such predictions. And so the battle

goes. One group minimizes the gains of the other in the big battle for budgets.

More talked about, but only a little closer to the customer is fuel injection. Much was said about this revolution, but the bloom seems to have gone. Chrysler still is not building cars with it despite the advance publicity.

Apparently, electronic fuel injection is not as foolproof as we were led to believe. It's just about as scarce an item as Mercury's 400-horsepower engine!

Air's the Thing

Meanwhile, air suspension has become the latest engineering fad. It hasn't convinced everybody, though. One engineer describes it as a "desperate move for a sales gimmick in a softening market."

(Cadillac, however, reports a good reception by the customer and is currently fitting 22 percent of its cars with air ride.)

Air suspension has great value in load-leveling, but in comfort it's a little like the fairy tale of the Real Princess. You recall the story of how the real princess was selected from a group of imposters when she alone was able to detect a small, hard pea beneath a huge pile of mattresses. Only a real princess can detect the added comfort of air suspension.

Detroit is buzzing with rumors, if not with business these days. Ford's realignment of the Mercury-Edsel-Lincoln divisions is an indication of uncertainty. Major changes in the GM styling studios is another. The future of Detroit big wheels is more uncertain than in many years.

Rumors are that General Motors is now committed to annual style changes of major proportions. No more mild facelifts. Every division is said to be working on an all-new look for 1959 — even Chevrolet and Pontiac. Ford also may have scrapped its 1959 plans and jumped ahead to '60.

These may be just rumors, nothing more, but they indicate the uncertain air that spreads over Detroit like a fog.

Detroit has always claimed it costs as much to build a small car as a big one, hence the small car is a poor dollar value for the consumer. An engineer at a recent SAE meeting listed many areas where big money would be saved in a practical small car: Simplify grille and bumpers; use just two headlights and taillights; drop the wrap-around windshield; simplify dashboards; eliminate four cylinders, dual exhausts and four-barrel carburetors. These moves, if done, will cut prices sharply and reduce maintenance costs as well.

Somebody must make this radical move soon or it may be too late, he said. It's frightening talk, but healthy—and welcome talk to lots of consumers. ★ ★ ★

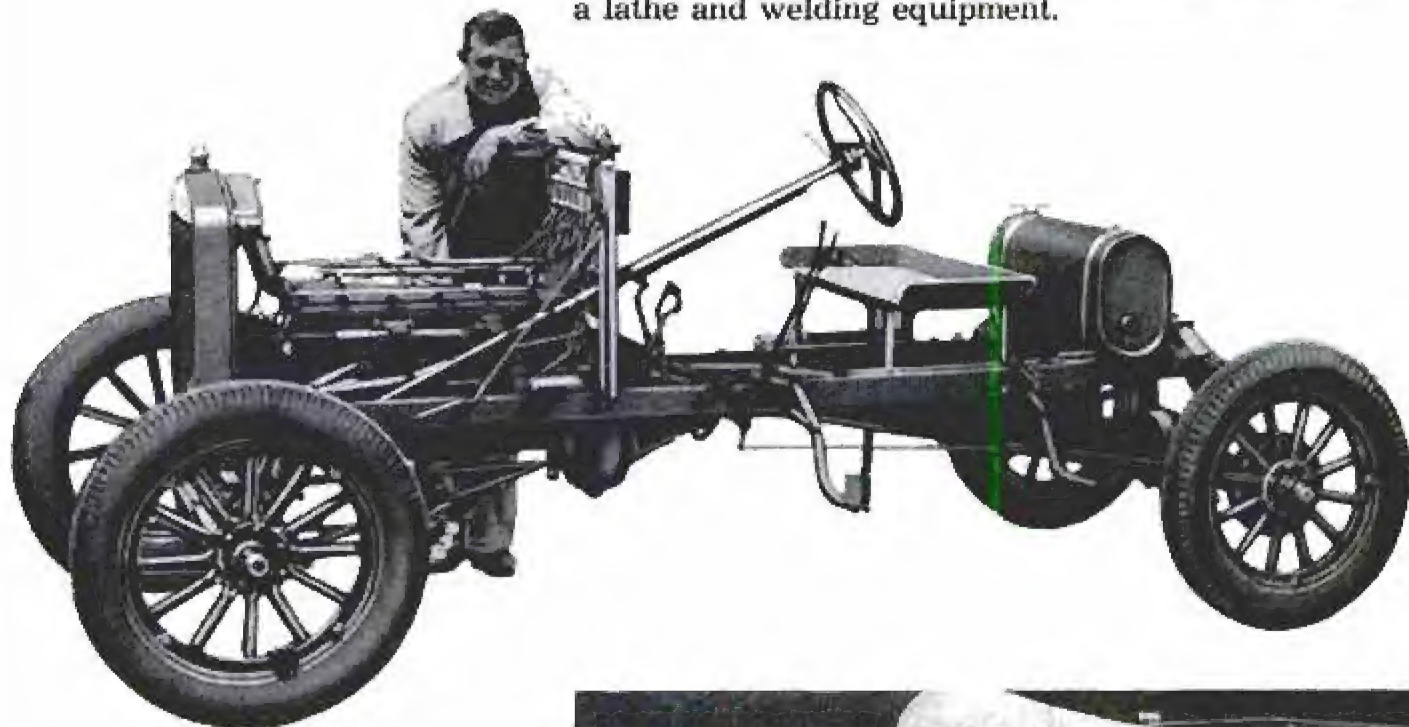
Battle Lines on Map Sent by Teletypewriter

Teletypewriter operators can transmit "pictures" of battle lines and weather fronts through a new system devised at the University of Michigan. At the sending end, the operator scans the line through a transparent grid and sends numbers which represent segments of the line. At the receiving end, the numbers are automatically converted into the line segments on a map.



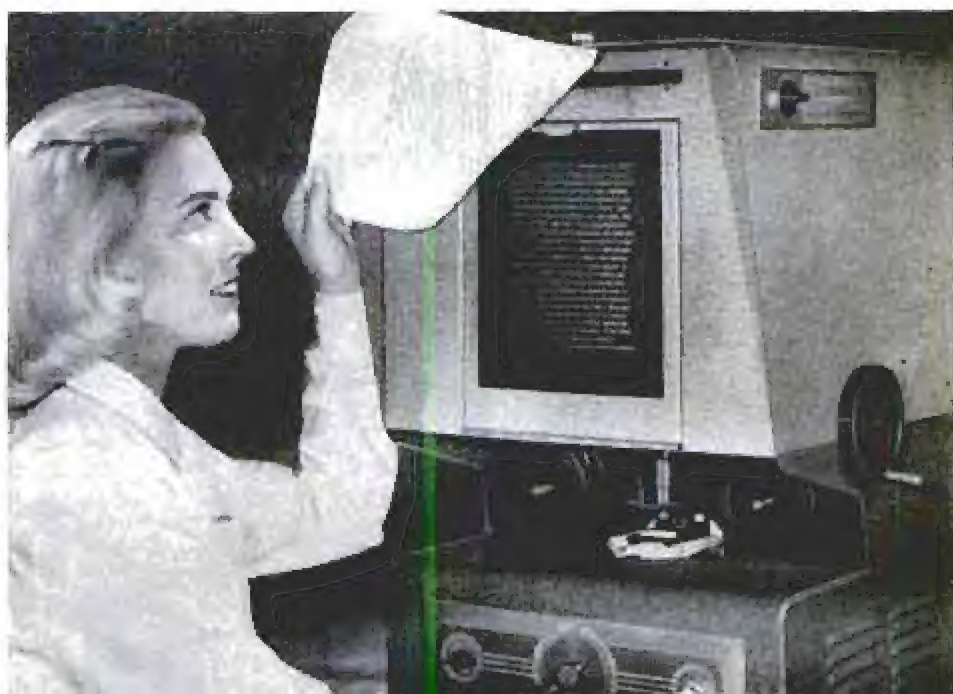
Father and Son Build Six-Cylinder Model-T Engine

Still in good operating condition is a six-cylinder Model-T Ford constructed around 1920 from two four-cylinder blocks. It's owned by Jim DeFrango of Hayward, Calif., who helped his father, Nick, perform the "operation" with an ordinary hacksaw, a lathe and welding equipment.



Microfilmed Material Reproduced in Seconds

Copies of microfilmed material can be made in 10 seconds by a recently developed desk-top microfilm reader and printer. Only three controls operate the machine: One knob locates the filmed material to be copied, a dial sets the printing time and a push button makes the print. No darkroom is required; all operations can be performed in normal light. The cost per print is about eight cents.



*A Killer in slow motion, the squat
little S2F is the Navy's*

NEMESIS OF THE SUBMARINE

By Marvin Weisbord





Plane director positions Tracker for take-off from a carrier. Practice rockets are visible under the wings

WHEN A NAVY PILOT landed his stubby S2F "Tracker" at an Air Force base not long ago, an Air Force pilot said, "Man, that's the oddest-looking ship I've ever seen." Two Navy destroyers, reporting the passage of S2Fs at sea, erroneously described them as obsolete World War II bombers. A Tracker pilot, folding his plane's wings after landing at another airfield, was astonished to hear the tower sending a crash truck. They thought his wings were falling off.

The obscure S2F, which baffles even veteran pilots with its small size and deceptively docile appearance, is as new and revolutionary in its field as the B-52 is in intercontinental bombing. Yet the Tracker is powered by two propeller-type engines first designed in the early 1930s. Its squat little body is barely half the size of the DC-3. It spends much of its time flying at a 140-knot crawl over open water at ridiculously low altitudes from 100 to 300 feet. Yet it is neither an observation plane nor a decoy.

Grumman Aircraft's Tracker is the first airplane ever designed from drawing board up as a carrier-based antisubmarine plane. In its field, it is the deadliest hunter-killer of submarines now flying. Indeed, it is the only carrier aircraft equipped both to find submarines and destroy them. Before the Tracker became operational in 1954, it took two powerful single-engine planes to get a sub. One large radar-equipped plane acted as "hunter"; a second AF loaded with bombs and a torpedo made the "kill."

Today a single all-weather Tracker is hunter and killer combined. Operating day and night, in fog, sleet, snow and clouds that keep their jet brethren grounded, the slow but deadly Trackers make their revealing sweeps across miles of open ocean to ferret out submarines. And pilots agree

that no sub now built can withstand a Tracker onslaught.

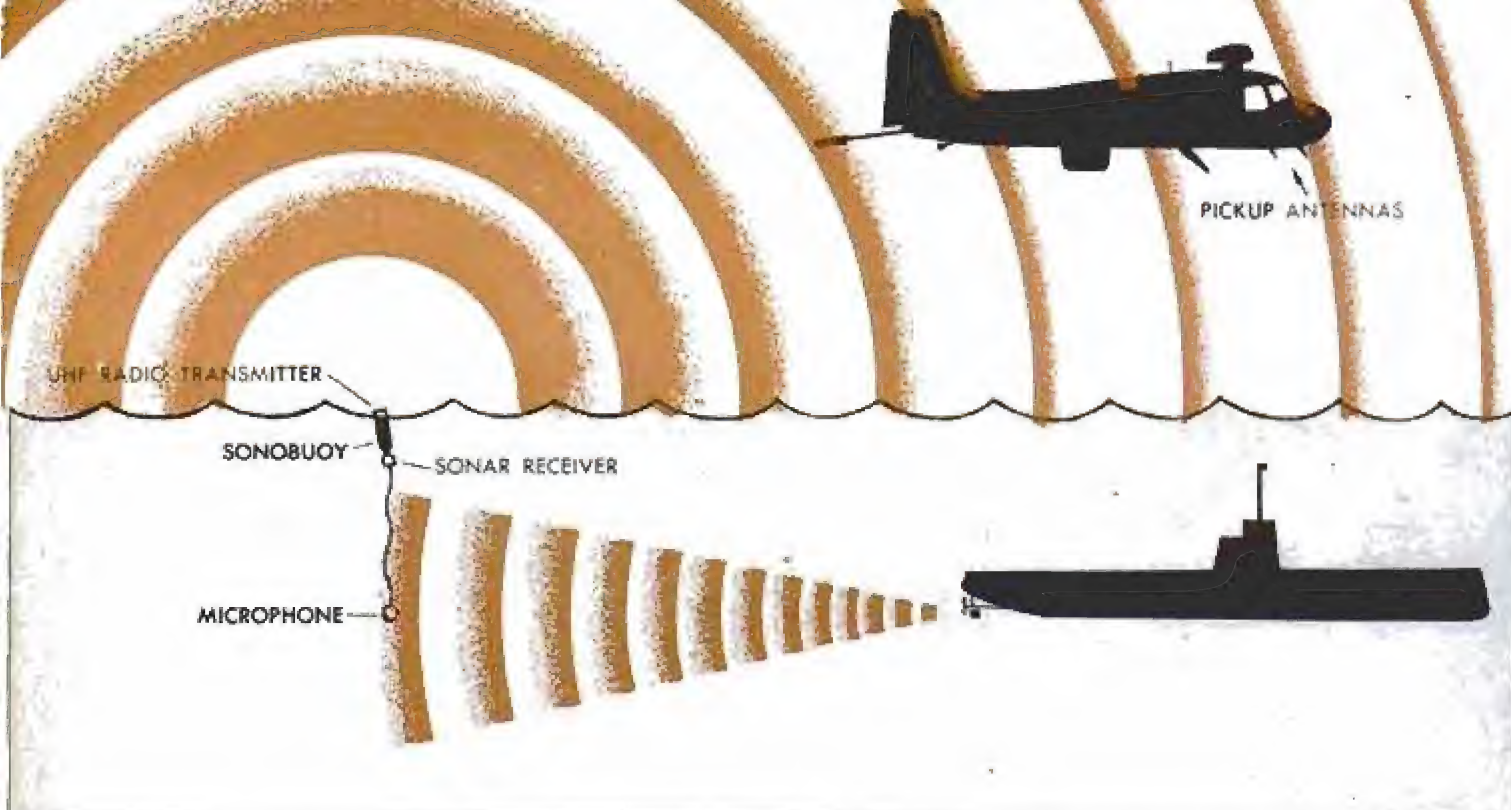
The Tracker pilot has a painstaking instrument job, at slow speeds and low altitudes. He is not the carefree barrel-rolling jet ace of the movies, but a methodical stalker in a mid-ocean cat-and-mouse game, and a careful, deadly killer once he has found his prey.

Three factors contribute to the Tracker's effectiveness against submarines: A wealth of electronic detecting and tracking devices including radar and MAD (Magnetic Airborne Detection); an arsenal of deadly weapons ranging from bombs and depth charges to the most advanced torpedoes and rockets; and a pair of 1525-horsepower nine-cylinder Wright engines, on either of which the Tracker can take off, fly and land if necessary.

An Air Force jet pilot, seeing an S2F for the first time, asked in perfect seriousness, "How does it fly with those things sticking out all over it?" He was referring to the

Crewmen load sonobuoys into pods located at rear of each engine nacelle. Buoys are spring-released





Sonobuoy picks up sound waves caused by submarine propellers. Transmitter on surface radios data to S2F

giant submarine searchlight on the right wing, the retractable radome peeking from the plane's belly, the capsule-like MAD boom tip extending just beneath the rudder, and the pod above the cockpit which houses navigation gear.

These appendages might seem strange to a man who flies smooth-skinned supersonic craft. Imagine this same Air Force pilot's surprise were he to witness a Tracker in action. On an actual mission, the radome, a radar antenna, descends four feet beneath the fuselage. The retractable MAD boom extends out 11 feet from the airplane's tail. And the Tracker sails lazily along a precise search pattern, "things sticking out all over it," its eyes and ears straining for contact with subs.

In the cockpit, each of the four hunter-killer crewmen performs specific jobs. The pilot does the actual flying and releasing of weapons and constantly checks and cross-checks both flight and tracking instruments. He must be especially precise about altitude. As one lieutenant puts it, "At 100 feet over the water there's not much difference between tracking a sub and becoming one—if you lose a little altitude." The copilot, who handles most of the navigating chores, makes the necessary voice reports to the aircraft carrier and other planes in the area. He also helps with the tracking and may spell the pilot on long, dreary searches.

Behind the pilots sit two combat aircrew men. They are enlisted men, petty officers, who work at one of naval aviation's most responsible jobs. These technicians operate the sensitive radar, MAD and other track-

ing devices. In effect they tell the pilot where to fly and when, and the exact moment to release his weapons. On the skill of these men rests much of the success of an antisub mission.

The Tracker's job is not an easy one. A submarine has the entire ocean to hide in. If the sub cuts its engines and lies quietly on the bottom, it is very difficult to detect. On the other hand, a sub that sits on the bottom doesn't sink ships. Sooner or later the undersea commander must take his vessel at least to periscope depth. If he's after a convoy, the sub makes periodic sweeps with its periscope and radar gear, then submerges again. If he's in transit, at one time or another the sub's skipper must either surface or put up a snorkel in order to recharge batteries.

During these moments when some part of the submarine sticks above water, the Tracker pilot can make contact with his radar from many miles away. Often as not a plane-crew member catches sight of a glinting periscope first and gives the alarm, "Sub!" Some pilots say that the human eye is the most reliable instrument for the detection of submarines. However, destroyers with their sonar, and helicopters, which can sweep a few feet over the surface of the water or hover motionless in one spot, aid the Tracker in its detection work.

Typical of Tracker squadron pilots in both Atlantic and Pacific fleets are the men of Air Anti-Submarine Squadron 36 based at the Norfolk, Va., Naval Air Station. Flying frequently from the aircraft carrier *USS Valley Forge*, these men train by pur-



Latest in sub-hunting equipment includes radome under S2F and magnetic airborne detection boom behind

suing and attempting to "sink" under mock battle conditions an American sub acting as enemy. They fly as much with their heads as with their hands.

"If you can narrow down a sub's position from the whole ocean to 10 square miles, you've got a reasonable chance of getting him," a pilot explained recently. Back from a practice antisub mission, he was sipping a soda in one of the *Valley Forge* ready rooms.

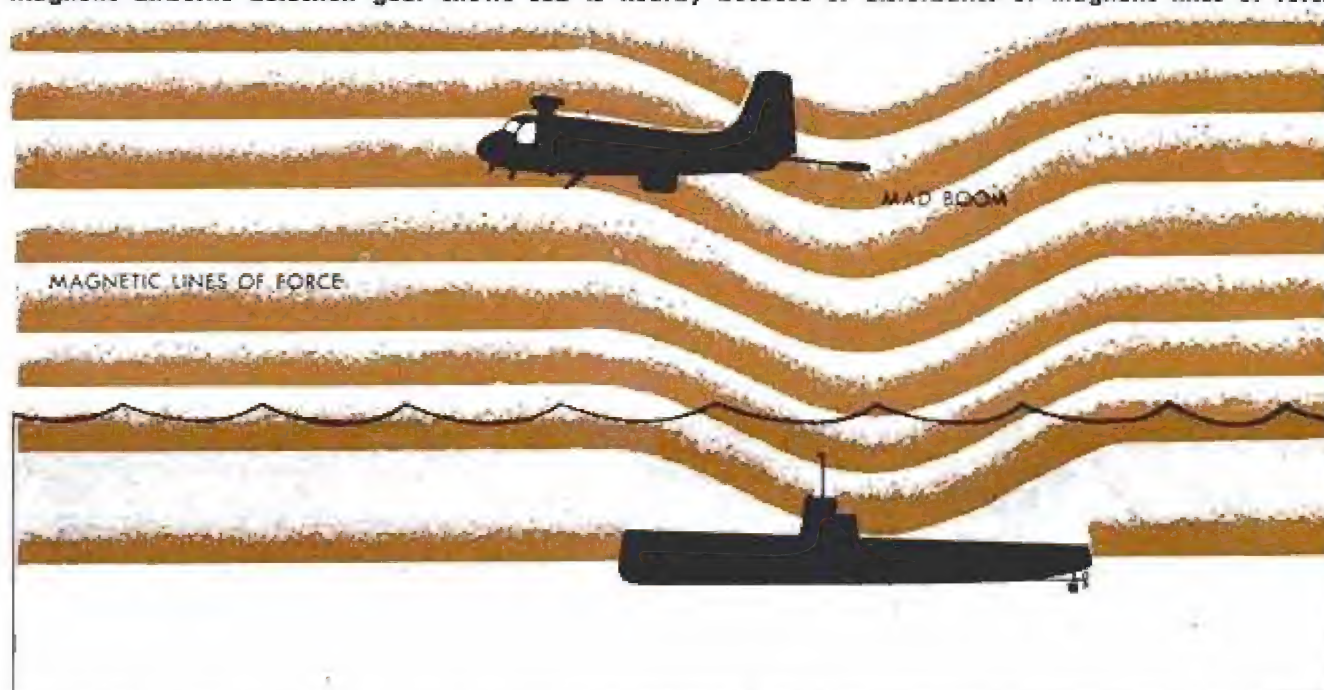
"You try to outfox the fox," the pilot continued. "For instance, on today's mission I knew the sub wasn't far away, but he was staying down and I couldn't pinpoint him. I'd fly in cloud cover for a while,

then dart out to check for his periscope. Turned out he wasn't biting. Sometimes we pretend to fly away in hope that he'll surface when he thinks we're gone. Next minute we come zooming over the horizon with a load of depth charges."

These ruses, however, rarely enable a Tracker pilot to make a fast kill. Usually he settles down to a slow, painstaking job of searching, making contact, tracking his quarry, and moving in for a methodical attack. Flying low with his sensitive MAD boom extended, the pilot traces a pre-arranged pattern across the water. Any disturbance in the earth's magnetic field,

(Continued to page 266)

Magnetic airborne detection gear shows sub is nearby because of disturbance of magnetic lines of force





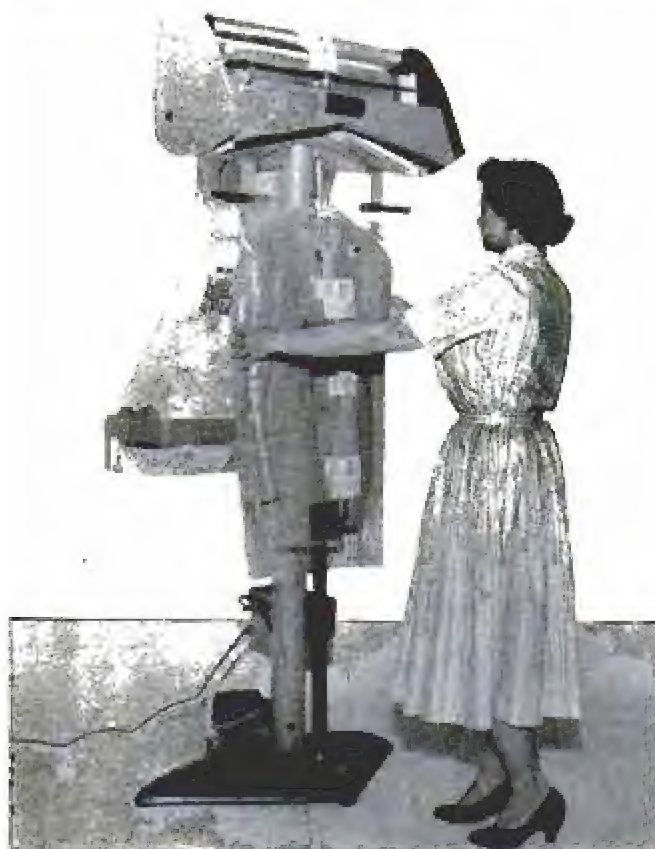
British Build World's First Vertical-Take-Off Airliner

Capable of transporting 48 passengers or 9000 pounds of freight at speeds up to 185 miles per hour, the British Rotodyne is

described as the world's first VTO airliner. Two Eland turboprop engines provide forward speed. Jet units move the rotor.

Dry-Cleaned Garments Are Sealed in Plastic

Transparent plastic bags are applied to dry-cleaned garments by a new machine. The garment is hung on the machine, which forms rolled plastic into a sealed cover. After the garment is removed, the cover can be used by the housewife to store blankets or other household items.



Six-Volt Flashlight Uses Four Dry Cells

Four dry cells fit into the barrel of a new six-volt flashlight, giving it the power of a utility lantern. The lamp weighs only 22 ounces despite its power. Its beam of light has a nighttime penetration of a quarter mile.



Watch Them Build

AMERICA'S ROAD BUILDERS are now at work on a task that is unprecedented in the history of any nation. Some notion of its magnitude may be had from this: the plan books for one eight-mile stretch of New York superhighway contained 1200 separate maps and thousands of single-spaced pages of specifications. Now they are building 41,000 miles of superhighways and are scheduled to have the job done by 1973.

By Ira Wolfert

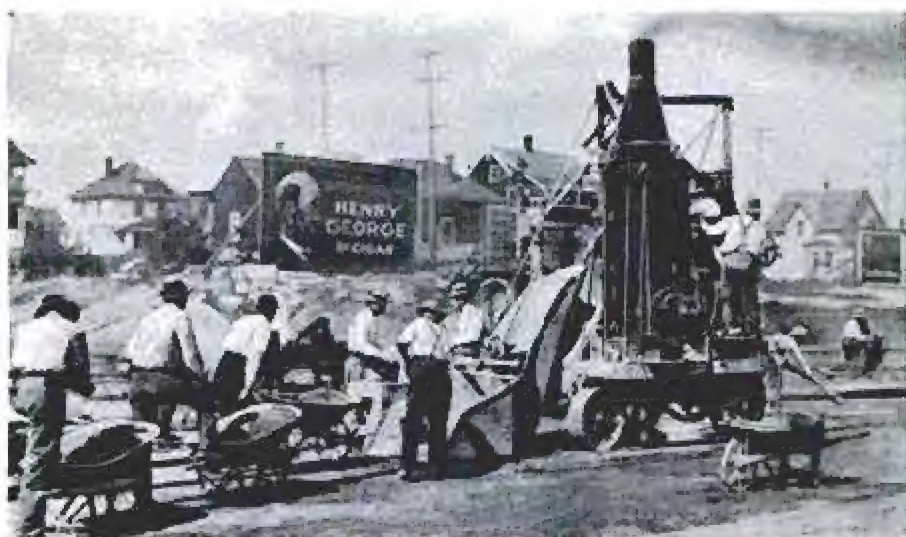
*500 West End Ave
New York City*

All photos, except as otherwise noted, courtesy American Road Builders

In the days of the five-cent cigar, highways were paved by men who loaded wheelbarrows with concrete from a steam-powered mixer. Modern equipment enabled contractors to pave the Kansas Turnpike, below, at rate of a half mile a day

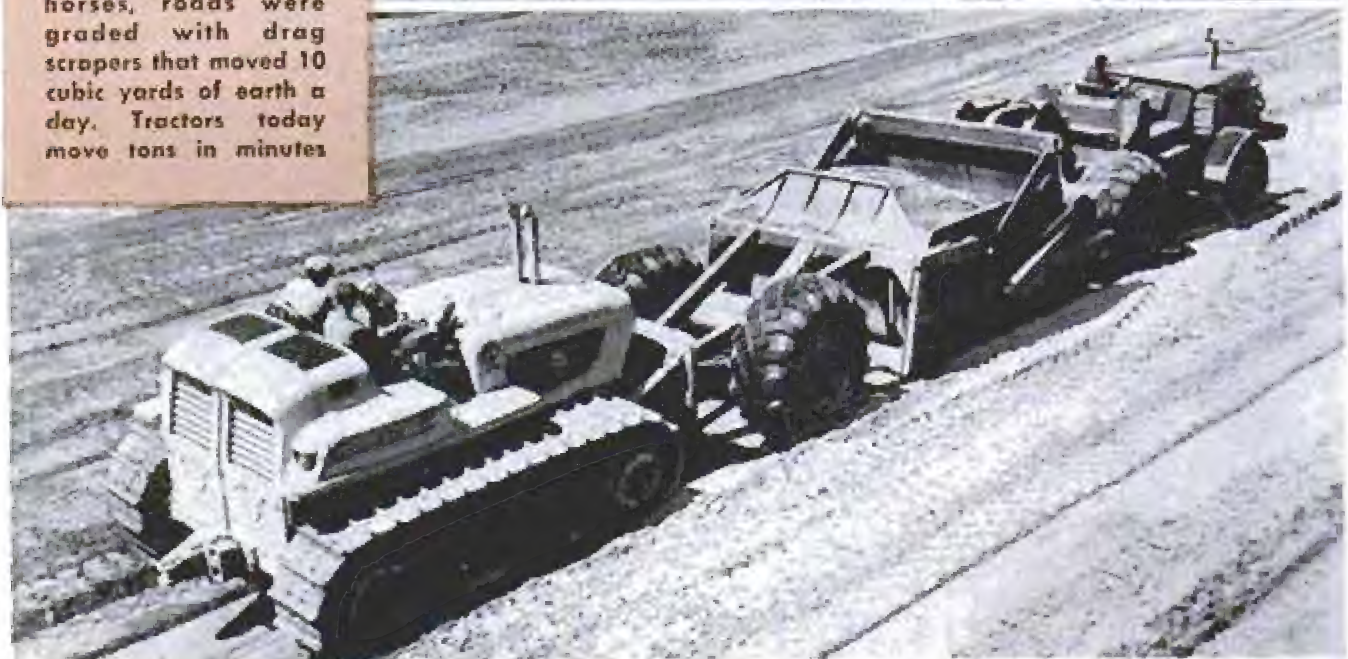
The design of some complicated structures requires 36,000 computations. The job calls for hundreds of thousands of bridges, causeways, trumpet exchanges and cloverleafs. That's a bugle blast of arithmetic such as has never been heard before. In addition, they are leveling, grading, draining, paving, shouldering, lighting, fencing and landscaping an area larger than the state of Rhode Island.

This is only for the new National System



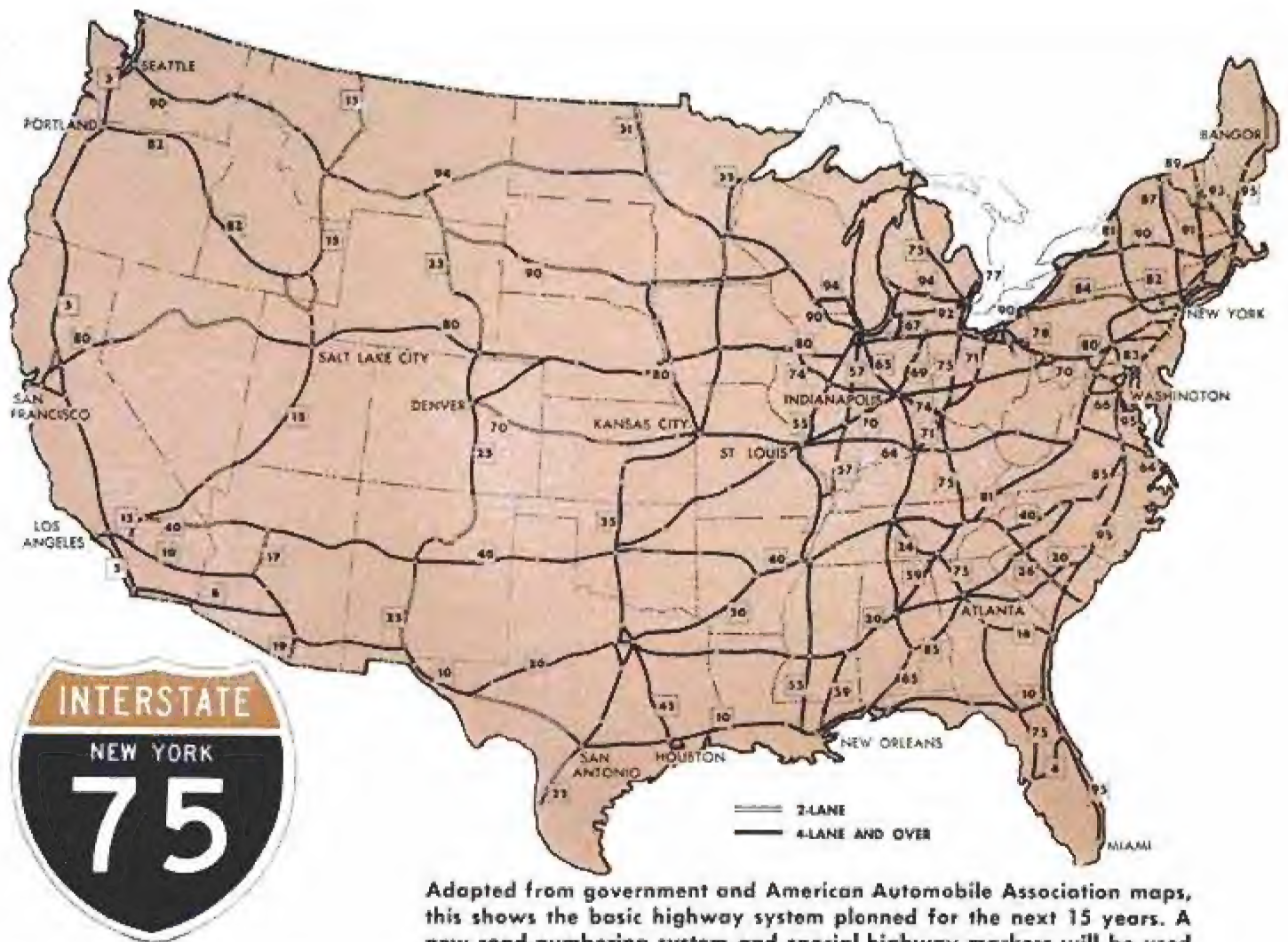


Fifty years ago, when horsepower meant horses, roads were graded with drag scrapers that moved 10 cubic yards of earth a day. Tractors today move tons in minutes



By the 1920's earth-moving had become mechanized but mule teams and wagons were still in use. The modern loader, below, shoots 15 cubic yards of dirt in 25 seconds





Adapted from government and American Automobile Association maps, this shows the basic highway system planned for the next 15 years. A new road-numbering system and special highway markers will be used

of Interstate and Defense Highways that will connect more than 90 percent of U.S. cities with a population of 50,000 and over. At the same time construction is under way on belt and arterial routes in all major cities, and on the elimination of bottlenecks in the existing 3,400,000-mile network of roads. Motorists began buying all this work on a pay-as-you-ride basis two years ago, paying one cent more for a gallon of gas or diesel oil. More money is being raised by increased taxes on tire rubber, trucks and buses.

What are the chances for completing so Herculean a labor on schedule? Well, after traveling around the nation to look, I can report: the things road builders can do nowadays have to be seen to be believed, and even then you have to look twice.

Last summer, where the U.S. 101 freeway was piercing the California redwood country south of Dyerville, a hill stood in the way of the approaches to a new bridge. The hill went up 500 feet at an angle steeper than a standing ladder. So they put the scrapers to work, hauling them up the slope, hooked to a tow cable.

With its rubber-tired wheels higher in some models than the driver, the modern scraper looks like a monument to a bug. But it can do the work of a thousand men

with dynamite and wheelbarrows. It took three minutes to get one of them to the top of the hill. There it unhinged its under-slung steel belly, plunking the cutting edge into the earth. Then it went plunging down. In one pass, nearly 30 tons of earth and rock slid up into the scraper's body. Then, the way ladies used to pick up their skirts to run, the scraper lifted up its belly and scooted away at 25 miles per hour to dump its load.

Where the rock was too solid for the scraper to cut with its own power, a tractor pulled it and another got behind and shoved. Over the hardest going, a ripper led the way. It had two steel teeth 30 inches long and, with tractor, weighed 28 tons. The teeth would be pulled, cracking and crunching, through the solid rock, to be followed by a tractor pulling a scraper that was being shoved by another tractor—making such a howl in the hills that even the echoes shrieked soprano.

On projects of this kind, when the hill has been scraped down enough to support trucks, loaders are brought in—a kind of scraper fitted with a conveyor belt. Now, instead of lodging in the body, the earth and rock slide up the belly onto a moving belt and are carried to the trucks alongside. I watched 22-ton trucks moving in

a steady stream, for it took only 10 seconds to load one.

On another California section of the interstate system, they are performing the greatest single excavation job in highway history plus other assorted bits of Brobdingnagias. For instance, Carquinez Strait is crossed by the seventh largest cantilever bridge in the world. By December there will be a second, even greater, bridge alongside it—each carrying traffic one way. And the highway, instead of curving around the hills as U.S. 40 does at present, will plunge through a man-dug canyon more than a quarter mile wide with walls on each side 350 feet high. The benches alone on these walls to keep them from sliding are 20 feet wide.

Dazing power, dazzling speed, amazing precision. "A lot of the work couldn't even be attempted by the old methods," Federal Highway Administrator Bertram D. Tallamy, told me. "Even if money was no object, they couldn't find room on the job to hold enough men and horses."

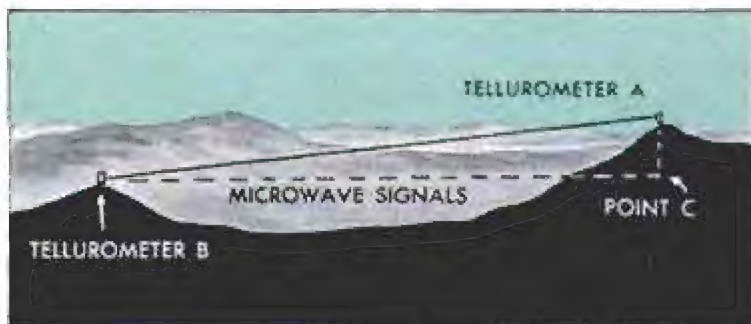
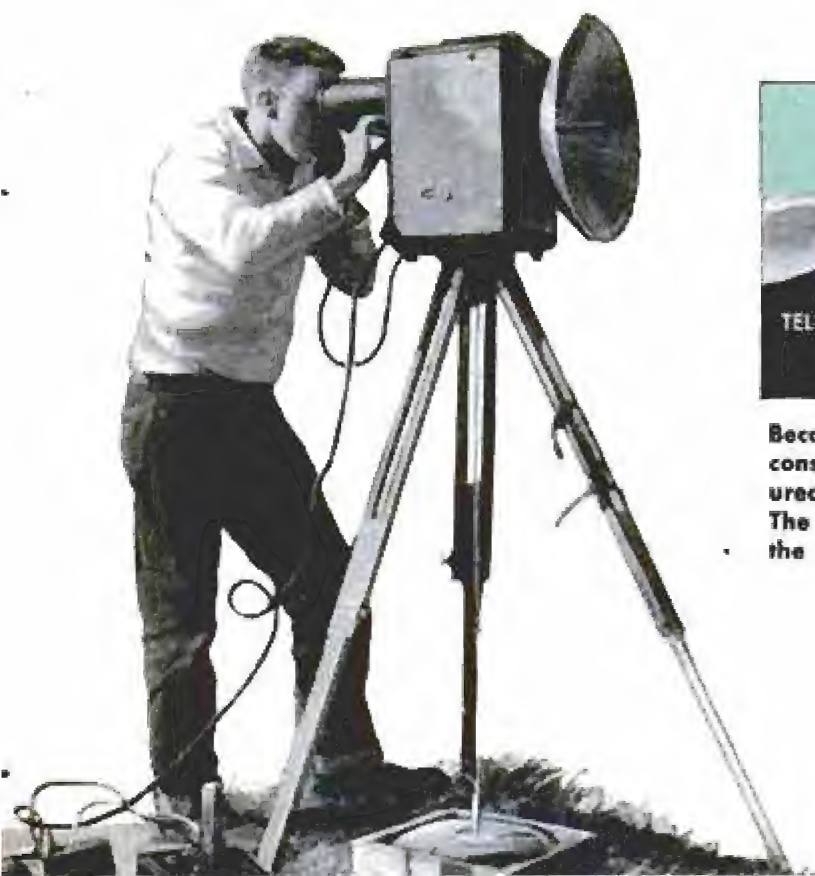
It's all a far cry from the way the roads we're driving on now were built in the 20s and 30s. Then they started with bushwhackers, surveyors and a man walking along with a chain to measure the land. Today's roads start in an airplane with a \$17,000 camera. While the plane travels 300 miles per hour at 2400 feet, pictures are taken every $3\frac{1}{4}$ seconds.

To get a three-dimensional view they take two pictures of the same area from different angles. Through the airplane and its modern camera, the highway engineer looks over the ground with needle-sharp eyes set 1440 feet apart in his head. A ma-

chine called a plotter superimposes the two pictures for him. John Wolvin, manager of the Chicago Aerial Surveys Company, told me a skilled operator with a modern plotter is able to tell you from aerial snapshots even how deep a body of water is and how many gallons it contains. He can make the machine draw a contour map that will fit the earth and every bush, every tree, every boulder on it as precisely as a contact lens fits an eyeball.

Old-time surveying—the bushwhackers, the transit man, the surveyor walking along with the chain to measure the land is being supplanted by a geodimeter or, since last June when the first one arrived in the United States from South Africa, by the more portable, quicker, Tellurometer. It directs a microwave at a prominent landscape feature up to 40 miles away and tells how many thousand-millionths of a second the wave takes to bounce back. The time is translated into miles, yards, feet, inches. "We call it pretty good surveying when there is an error of only eight feet in 40 miles," said Capt. J. H. Brittain of the U.S. Coast and Geodetic Survey. "With the Tellurometer, there's a possible error of only eight inches in 40 miles."

Today we are driving six times as many automobiles twice as fast ten times as far as our roads were designed to carry. The increase in trucking alone since 1931, when our present highway system was being completed, has been overwhelming. Last year interstate trucks alone carried 240 billion ton-miles of freight—about 12 times as much as 26 years before. Yet in that time we have added comparatively little to our road system.



Because speed of microwaves between Tellurometer units is constant, the distance between points A and B can be measured by the time it takes signals to travel between the points. The distance between B and C can be easily calculated after the difference in altitude, between A and C, is measured



Building a paved road in 1909, above, was a slow process with only a steam-roller and a wagon load of rock. Modern pavers put down a 16-foot asphalt lane of roadway in a single pass



One reason for this inadequacy is that until recently it was impossible to make adequate surveys on which to base reasonable traffic forecasts. But now there are pressure pads built into the roadbeds, electric eyes gazing from traffic stanchions, radar in cans hanging from light poles. Even if there had been the means for collecting so voluminous a mass of information 25 years ago, there would have been no way to cope with it. A single survey made recently for one Massachusetts section of the interstate system would have taken one man with a desk calculator 10 years to make it add up to anything. An electronic computer did it in two days. A computer program in the Georgia State Highway Department makes geometric calculations for skewed bridges in 10 minutes. With old-time calculators it would have taken about a week. Now 27 state highway departments have electronic computers. At least 11 more have them on order.

The traffic survey shows where how much road should be built. But the way the road should go must be decided by the designer. His job is to draw a line, through the aerial picture, that will require the least valuable land, the least amount of earthmoving, the least amount of drainage ditches and culverts, be the shortest dis-

tance, do the minimum damage to the value of the neighboring area and provide the greatest service. One thing must always be juggled against another. If I go over this flat field instead of through this hill, how much will it cost to get dirt to fill that low spot there? If I cut through the hill, I will have a downgrade to accelerate the entering traffic, an upgrade to slow up the exiting traffic, but how much grass seed will I need to hold the embankments? At what angle will the winter sun hit the south slope? Those are questions the highway engineer must resolve before even starting to design a road.

Scenery Is Safety Aid

And Tallamy is exhorting him to juggle one more factor—beauty. "Open up a view," he pleads. His passion is more than aesthetic. The superhighways already in use in Texas, California and eastern states have consistently carried higher-speed traffic at less than half the national fatality rate per mile traveled. Scenery plays a part in their excellence, Tallamy says, because it snaps a driver out of the hypnotic fog that can settle on him during a long, monotonous haul.

The new Washington-Frederick, Md., highway is an example in many respects of

(Continued to page 270)

You Can FORECAST WEATHER *by the Clouds*

By Eric Sloane



Eric Sloane, famous as the "cloud man," started his career in this field by doing an Air Force manual on the effects of high altitude on the human body. After the war he designed and built the Hall of Atmosphere in the American Museum of Natural History. He has written a number of books on clouds and weather forecasting. He reports that "the rest of my life will be spent in doing murals and paintings of the sky"

THE WEATHERMAN who makes his maps without even looking out of the window might frown upon predictions by cloud observation. Yet there will be times outdoors when the sky is all you have to consult. Tomorrow's actual weather is over the horizon, sometimes over two or three horizons, so what you see overhead concerns the weather you already have. Yet folklore—and science, too—prove that the sky has a message, very often giving hints to the weatherwise of what tomorrow's weather will be.

Of prime importance is the direction of upper clouds. A wind driving upper clouds usually lowers and becomes a surface wind after a while. But knowing the prevailing fair-weather winds (usually west to northerly in temperate winter months and west to southerly in temperate summer months) is the basis for field observation and prediction.

The subtle coloring in clouds is often unnoticeable because the glare of the sky is too strong. By painting the underside of a pane of glass black, you may observe the sky with less strain and glare; sometimes the beauty of the reflection in your "black glass" is worth the trouble.

A hundred years ago, when every man was a farmer to some extent and his livelihood depended largely upon knowing what tomorrow's weather would be, daily weather diaries were kept. Why not try this system? By simply jotting down your observations daily for one month you can see what weather follows each sky condition. You will be well on your way to weather wisdom.

It is remarkable that we who live beneath clouds all our lives often are unaware that clouds have anatomy. Imagine yourself in a large room. The puff from a cigar or cigarette smoker would be a cumulus shape. Then observe the flat layer of smoke that settles over the whole room; that would be stratus cloud shape. Go out to the kitchen and open the refrigerator; shapeless icy wisps float out—cirrus clouds. Cloud nomenclature is that simple.

Motion pictures of clouds show they have birth, development and decay. Cumulus clouds open like giant white roses, then drop their "petals" and disappear back into the atmosphere. Even simple snapshots of a thundercloud taken at one-minute intervals will show the symphony of cloudlife.

(Continued to page 226)



Cloud forecasting begins with a knowledge of cloud shapes. Although there are many scientific names in cloud lore, there are only three basic shapes. Learn these and you have taken the first step toward becoming a cloud expert. The names of the three shapes somewhat resemble the clouds themselves: Icy

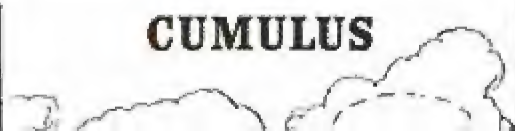
"cirrus" clouds, accumulated "cumulus" clouds and straight-ceiling "stratus" clouds.

CIRRUS wisps hover above 30,000 feet; CUMULUS ranges from fair-weather lumps at 4000 feet to cumulo-nimbus thunderheads 35,000 feet high; STRATUS ceilings are like lofty fogs. Try picking out these shapes above.

CIRRUS



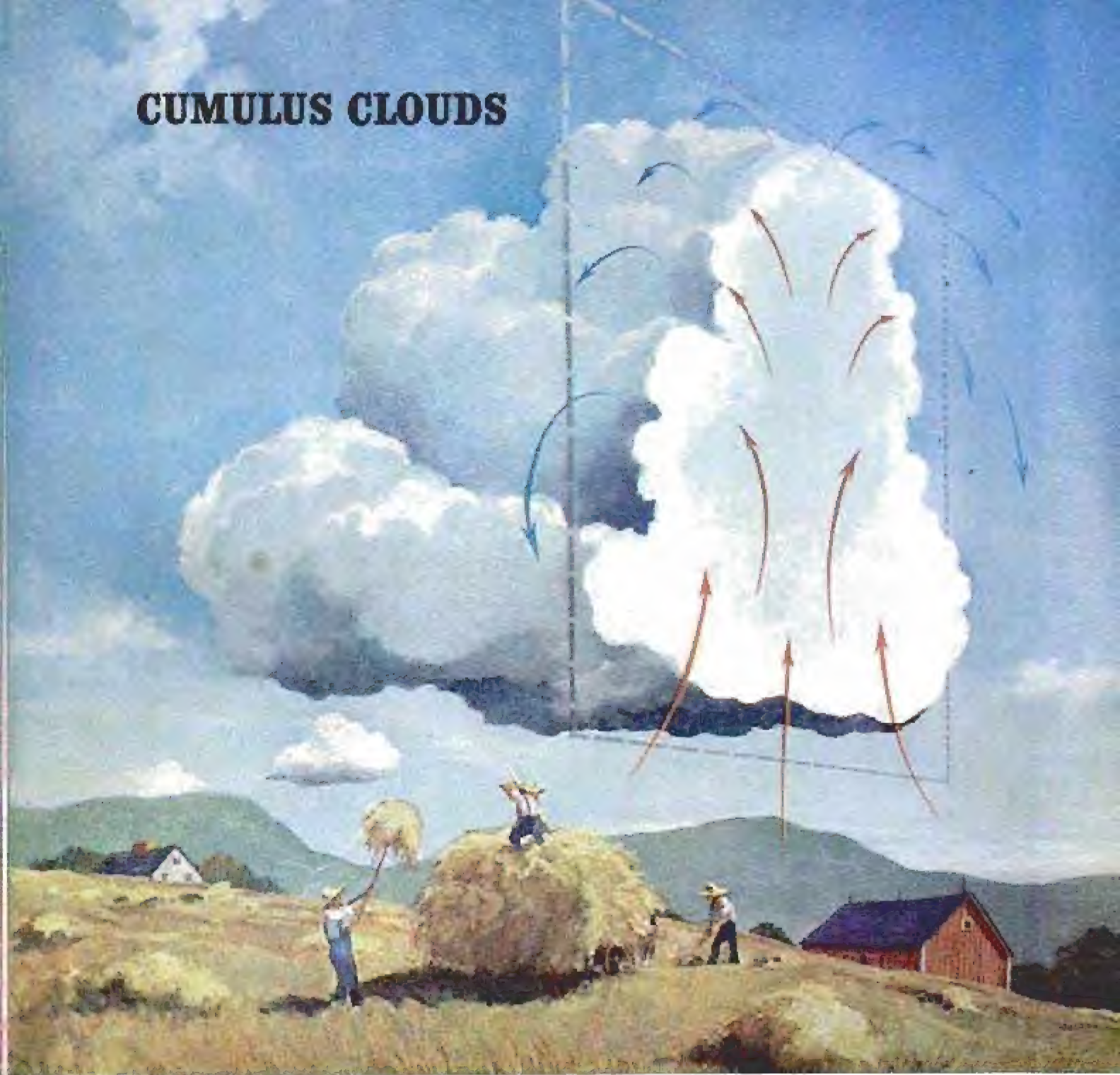
CUMULUS



STRATUS



CUMULUS CLOUDS



Cumulus clouds form when sun-warmed air cools. Coldness comes with altitude. Cooling shrinks (condenses the volume of) air, squeezing invisible moisture (vapor) into visible droplets (clouds). This miracle occurs at about 4000 feet.

If you wring out a wet towel, the drier the towel the more you have to squeeze to produce water. Likewise, the drier the air, the more height (chill) is needed to squeeze its vapor into a cloud. Above is a cross section through a cumulus. Red

arrows show rising thermals (warm air). Blue arrows show falling currents of cooled air. This mechanical cell might last 20 minutes or so as the cloud builds up, then disintegrates back into the air. If the air is very wet and very warm, cumulus can grow into a thermal thunderstorm.

The drawings below show sequence of a cumulus, and why it is the visible upper part of a thermal cell. Any fine white cloud may have started as swamp water or moist dirt some 50 miles away!

Sun-warmed earth forms heat-canopy aloft, which leans with wind

Heat bubble breaks from earth and rises to condensation level

Thermal over 4000-foot condensation level becomes visible cloud





Above are two fields of cumulus clouds with different heights, shapes and colors. The clouds on the left are high, oval-shaped with flat bottoms. They indicate fair weather. The clouds on the right are chaotic and tufted, resembling shellbursts. They are lower and darker. This sky promises showers.

Darkness in clouds is no indication of rain if the clouds remain high. However, thunderstorms usually move from west to east, so darkness in the west is always a threat.

The most important thing in cloud watching is to note the direction of movement. If clouds are moving in prevailing-wind direction, fair weather is best assured.

Learn prevailing winds (usually west to northerly during winter, west to southerly during summer) and you can tell fair skies from threatening ones. Storms never come from wind direction because winds always pinwheel around low pressure; face wind and nearest storm center will be on right (opposite in southern hemisphere).

FRONTS

Weathermen look for rain along fronts. Fronts are merely the prows of moving air masses. Along these collision fronts storms most often occur. When weather is cool, a warm-air mass usually brings the next rain; when it is warm, a cold-air mass usually brings the next storm.

The next four pages show invading cold and

warm-air masses with their characteristic clouds. Cold air is heavy and noses downward, with its front slanting back; cold-air masses feature cumulus types, short hard rains and good visibility.

Warm air is light, slanting overhead for hours before its rain, which is slower and longer lasting; clouds are stratus, and visibility poor.

CLOUDS OF THE COLD-FRONT STORM



FRONTAL
LINE



When warm-weather cumulus clouds darken and lower (usually from the west) and cobweb-ceiling (anvil top) flows overhead, a cold-air-mass storm is less than an hour away



Cold air (blue arrows) plows under warm air (red arrows) pushing it up into a boiling line of squall clouds. Rain is just ahead under approaching thunderhead (cumulo-nimbus)



ANVIL TOP

CUMULO-NIMBUS

COLD AIR

↑
Thunderhead arrives with torrent of rain. Updrafts rise to about 35,000 feet, flattening into anvil top which flows ahead of storm. Rainfall is heavy, but storm is soon over

↑
Front passes, rain stops. You are now within the cold-air mass, with clear air, good visibility and high cumulus puffs. Note how all cold-air-mass clouds have been cumulus types



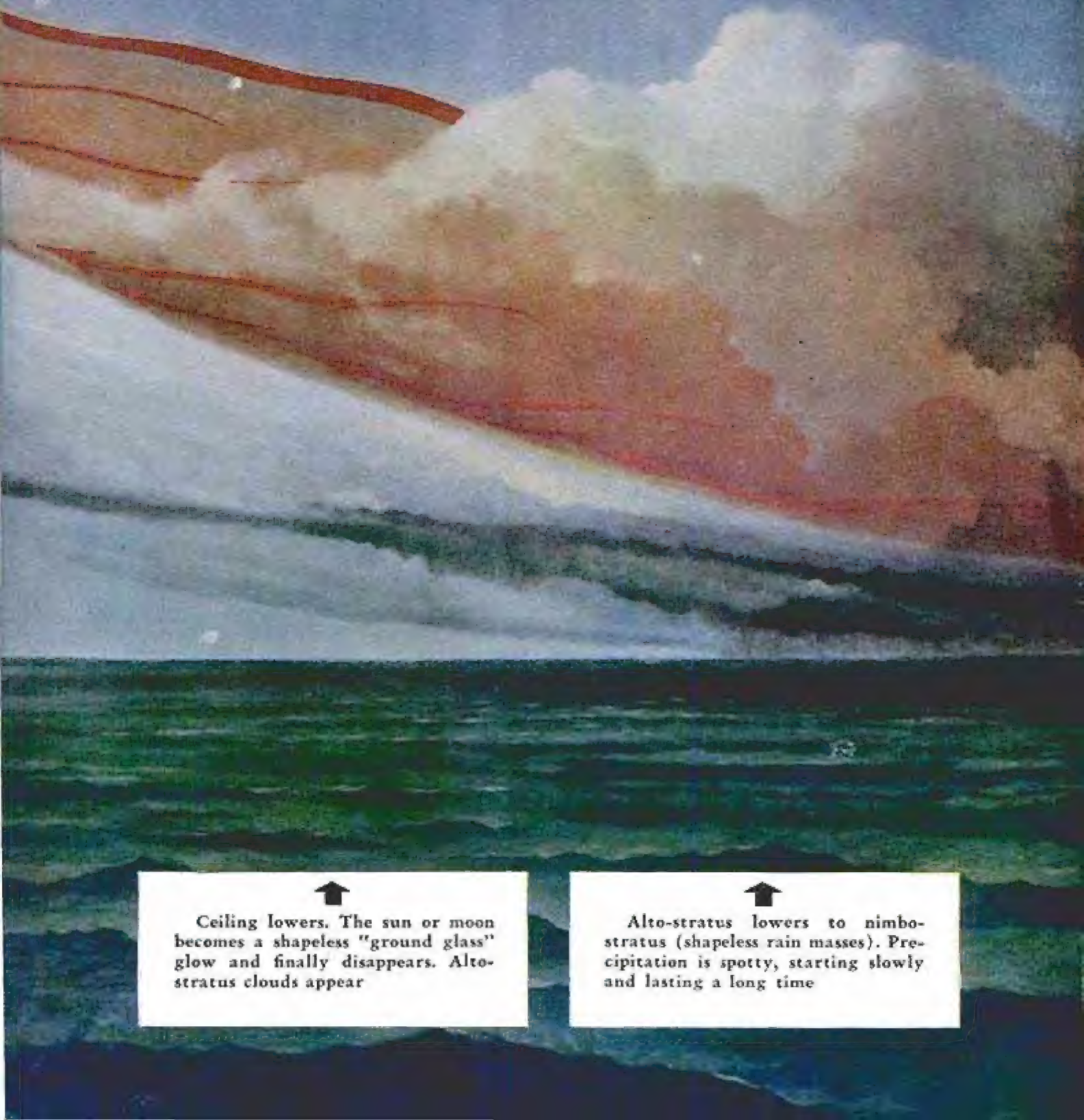
Nonprevailing wind, cirrus wisps (cobwebby ceiling) indicate tip of an approaching warm-air mass. Rain is about 800 miles away



Overcast thickens to foglike sheets (cirro-stratus). Sun or moon shines through, but a halo appears. Rain is imminent

CLOUDS OF THE WARM-FRONT STORM

Although snowplow angle of the cold front gives little warning, warm air (red arrows) flows overhead from 10 to 40 hours before rain occurs. The sloping front may be 1000 miles long. Rain often lasts "as long as it took to come." The storm is usually sullen, less violent than a cold-front storm. Air in the wake is usually warm, hazy, moist and visibility is poor. Note the sequence of stratus-type clouds and the slant of warm air.



Ceiling lowers. The sun or moon becomes a shapeless "ground glass" glow and finally disappears. Alto-stratus clouds appear



Alto-stratus lowers to nimbo-stratus (shapeless rain masses). Precipitation is spotty, starting slowly and lasting a long time

The outdoorsman who can't get weather reports must depend upon his own observations. There is a good deal of superstition about the weather, but some folklore has a sound scientific basis. Below are some of the superstitions with a

strong element of truth. Remember them and you will be better able to predict tomorrow's weather. They may also be useful in predicting the weather for a specific location when reports are general and uncertain.



SOUNDS ARE HOLLOW BEFORE RAIN: Lowering clouds (A) make distant sounds (planes, trains, etc.) louder, with an echo effect

DISTANT SHORES SEEM NEAR BEFORE RAIN: Unstable air (B) removes salt haze, making the horizon clearer



NO DEW, SURE RAIN: Heaviest dew forms in cloudless air. Heavy dew, fair tomorrow

DULL MOON AND STARS FORETELL RAIN: High-altitude air inequalities cause moon and stars to appear fuzzy. Sharp moon and untwinkling stars foretell clear weather tomorrow



SUNSET COLORS FORETELL WEATHER: Moisture in western air (which will reach you tomorrow) tips off the weather. Red means fair; pale yellow-gray, rain; bright yellow, winds. Colors, remember, refer to the sky, not the actual sun

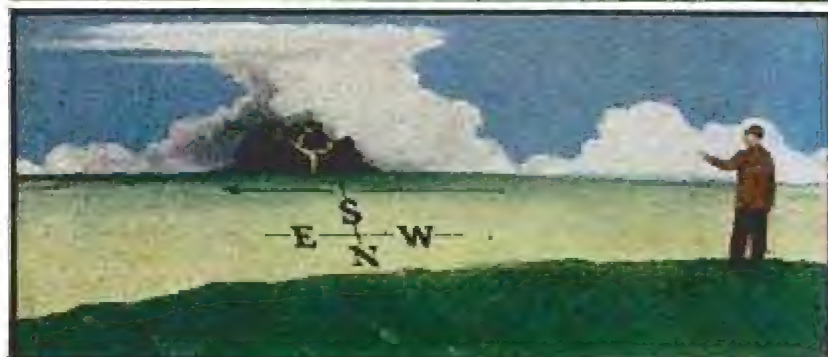


SUN AND MOON HALOS HINT RAIN: Halos occur in ice clouds of approaching warm-air rain

BIGGER THE HALO, NEARER THE RAIN: Lower clouds cause bigger halos, so rain is that much closer. Halo predictions are most accurate during warmer months



FACING WIND NEAREST STORM IS ON RIGHT: Counter-clockwise spin of low pressure makes this true in northern hemisphere. Just the opposite is true in southern hemisphere. This works with all low-pressure rains and will tell the location of a hurricane's eye and plot its movements



MOST THUNDERSTORMS MOVE EASTWARD: Lightning seen from anywhere but western sector of sky is from a storm which will pass you by. The anvil top of thunderheads flows in the direction of the storm



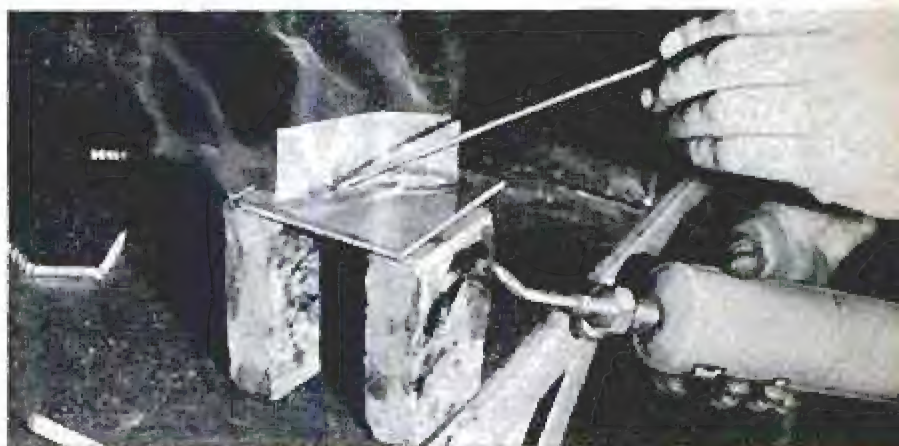
Giant Canoe Resembles Craft Used by Fur Traders

Perhaps the largest birch-bark canoe ever built was recently launched at Golden Lake, Ont., Can. It measures 36½ feet

long and 6 feet wide. A giant reproduction of canoes used by early fur traders, it will be displayed at Canada's National Museum.

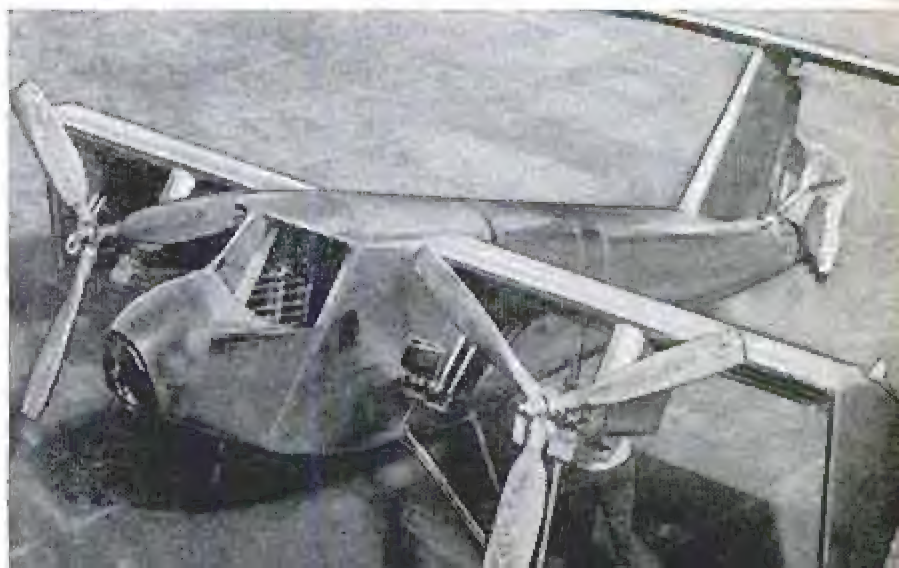
Nonferrous Metals Joined By Heated Wire Flux

Any nonferrous metals can now be joined by a chemical technique said to be different from soldering, welding or brazing. Wire strips of a special material are fed into the joint as it is heated with a torch. It takes about one minute to form a joint sometimes stronger than the metals involved. Aluminum, copper, brass, zinc, gold and many other metals can be joined by the new process.

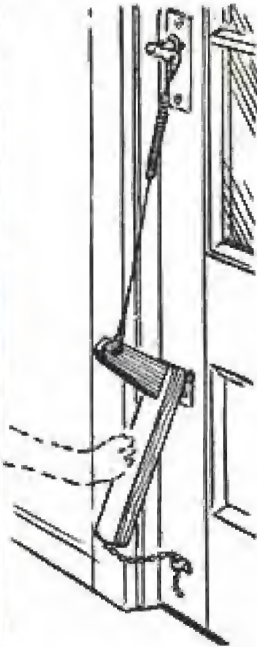


Plane Takes Off Vertically With Extended Wing Flaps

Double-retractable wing flaps that extend below the trailing edge of the wing permit a Ryan research plane to make vertical take-offs and landings while the fuselage remains in the conventional horizontal position. The extended wing flaps form a hood that forces the propeller slipstream downward, providing vertical lift. When aloft, the flaps retract for normal forward flight.



Paw-Powered Latch Opens Door for Dogs That Like to Scratch



Dogs that scratch at the door to be let in will find a homemade "dog latch" to their liking. For his dog, Henry Leeb of Gladstone, N. J., built a right-angled scratch board, the top of which was attached by wire to a hole drilled in the door handle. Leeb hinged the upper part of the scratch board to the door. Now Mr. Leeb's dog presses a paw on the board to turn the handle and open the door.

Ⓢ Fuel tanks on the Douglas DC-8 jet airliner will stretch from wing tip to wing tip and the overseas version will have a capacity of 140,500 pounds of fuel—equal to the total take-off weight of the present DC-7C airliner.

Braille Is Reproduced in Quantity on Modified Duplicating Machine



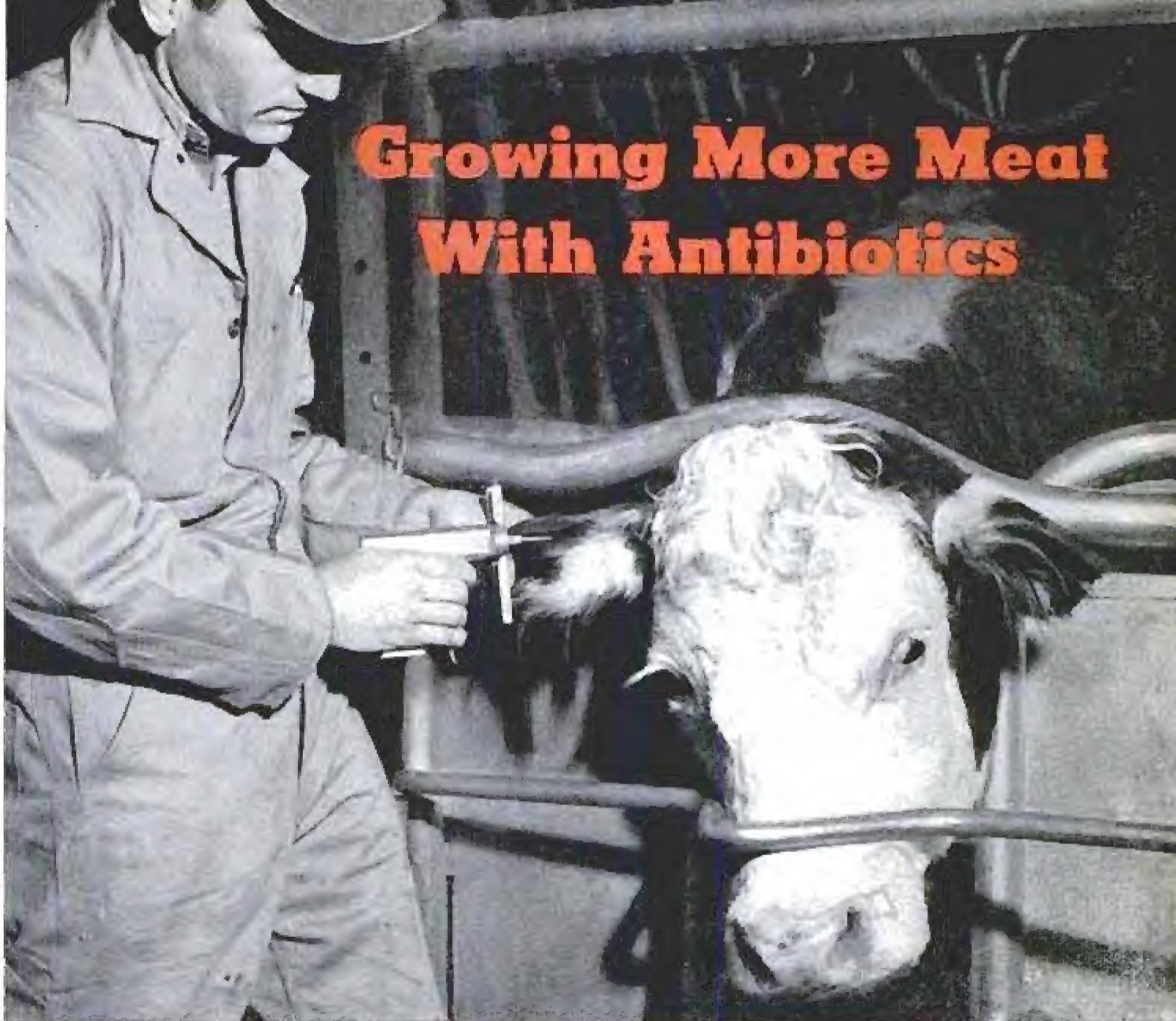
Special Braille type has been developed for use on some standard duplicating machines which have been modified. The Braille type, which allows blind persons to "read" by feeling raised dots representing words, is set a line at a time. The lines are then set in channels cut in the drum of the duplicating machine. The new process makes it possible to produce "printed" material for the blind in quantity and at low cost.

Ⓢ So sensitive is a new military TV camera that light from an ordinary match reveals as much to the camera as a man with 20/20 vision sees in the light of a 150-watt electric bulb.



Machine Speeds Pipe Laying

Operating at speeds up to three feet per minute, a small automatic trenching machine makes a clean cut wide enough to lay underground electrical cable, lawn sprinkler systems or cold-water pipes. Hardened steel teeth of the saw cut through rugged soil where hand trenching would be almost impossible. Three models trench to depths of 12, 18 or 24 inches. The machine is attached to an aircraft cable which guides the saw while the operator does other tasks. The trencher stops at the end of the cable.



Growing More Meat With Antibiotics

Chas. Pfizer & Co. photos

Hormone pellet, implanted in steer's ear by "gun," will increase its growth nearly 20 percent, on less feed

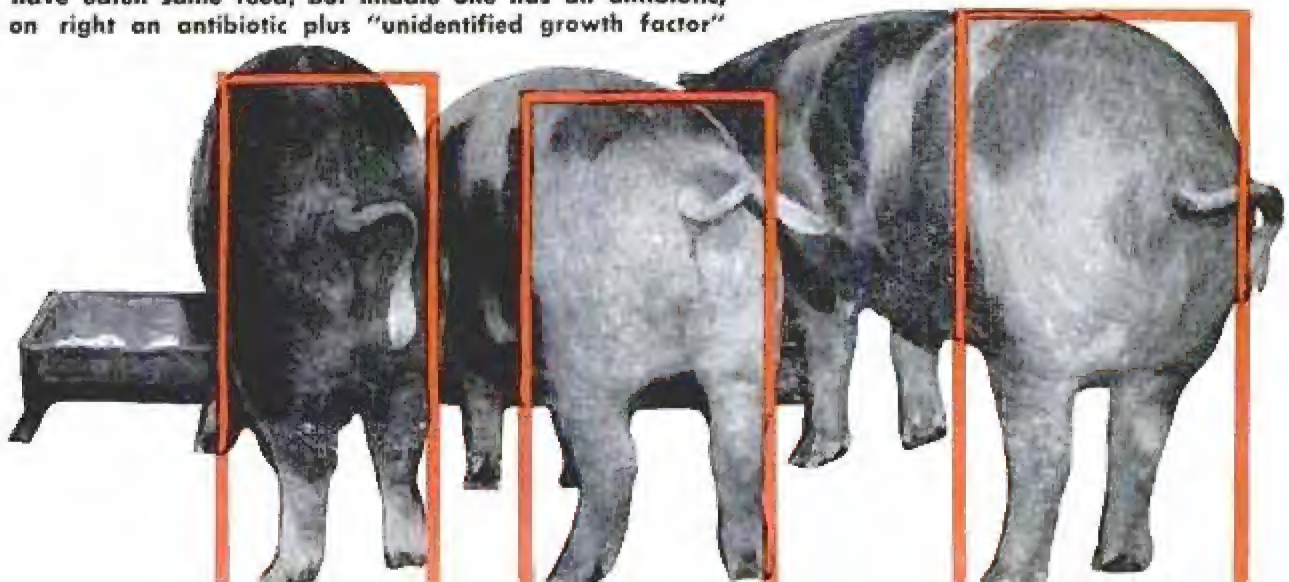
By Clifford B. Hicks

THROUGHOUT THE WORLD there are more than 57 million square miles of land. Scoop up any single teaspoonful of this dirt—from Aachen to Zeebrugge, to your own back yard—and you will be

holding in your spoon a population of up to 300 million invisible, living creatures.

These specks of elementary life—a few of them at any rate—are science's latest gift to the farmer. Put to work on the

Pigs have eaten same feed, but middle one has an antibiotic, one on right an antibiotic plus "unidentified growth factor"





Search for new antibiotics begins with soil samples gathered by travelers in all parts of the world

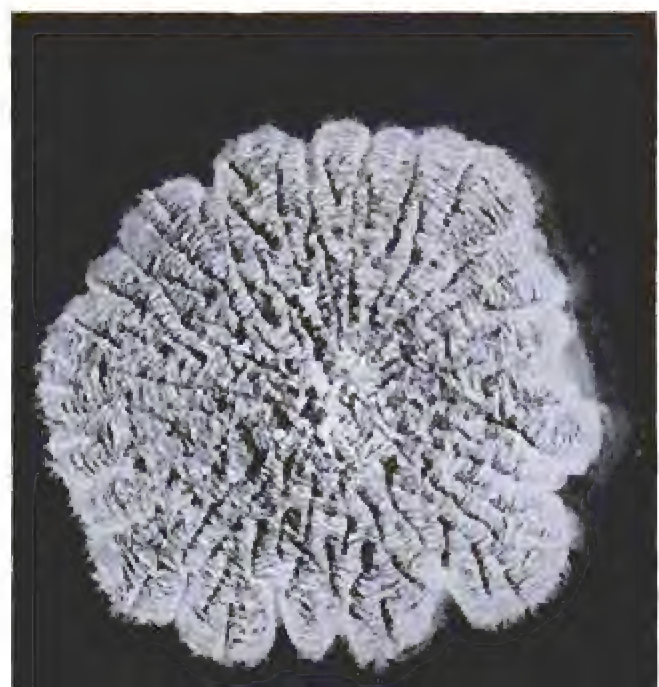
farms and ranches of this country, they are producing heavier and healthier cattle and hogs. They are doing this in a shorter time and on the same amount of feed, or even less. They are bringing broilers to market weeks ahead of their normal time. And on many farms they are bringing one extra egg into existence for every four eggs of expected production.

After a culture is made of a new antibiotic, colony of bacteria is placed in it to test its lethal power

The scientists themselves admit they aren't sure how the invisible organisms do their farm chores. They're trying to find out. Meanwhile their minute little friends are going right on producing more meat and eggs, and doing it faster than ever before in history.

These invisible specks of life are the same ones that have saved countless human

This is a pure colony of the mold used in production of Terramycin, isolated after study of 100,000 cultures



lives in the last 15 years. They are the "living factories" that turn out penicillin and aureomycin, streptomycin and Terramycin, Chloromycetin and all the other "wonder" drugs. The organisms produce chemical substances—antibiotics—which the family doctor uses as medicines. The farmer now uses them, not only as medicines, but as growth stimulators.

If you peer through a microscope at that spoonful of moist dirt you'll see a spectacularly beautiful jungle. In this lush setting, the tiny beings wage violent and relentless warfare against each other for food, for water, for living space, for survival. Their weapons are the antibiotics they produce.

These organisms are the molds and other fungi, more easily classified as plants than animals. A few are harmful to man, but most are either harmless or beneficial.

Primitive peoples long have recognized the curative ability of molds. More than a thousand years before Christ, the Chinese used a moldy soybean curd to clear up skin infections. The Indians in Central America used fungi to treat wounds long before the word penicillin ever entered our language.

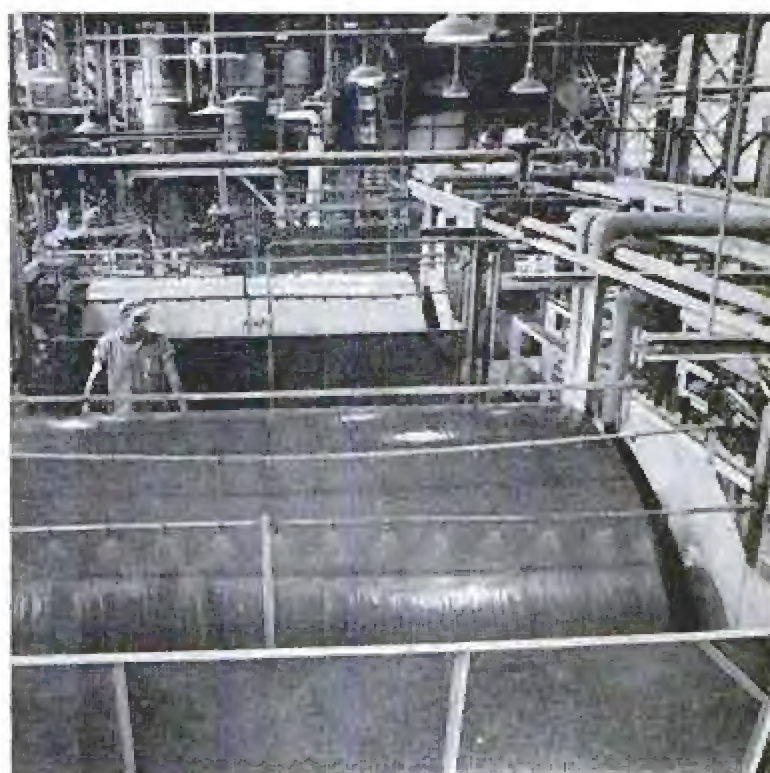
Back in 1928, Alexander Fleming discovered the potent power of penicillin. Little attention was paid to his discovery until World War II, when British researchers turned to Fleming's papers as a possible source for a new drug to treat the wounded. The first human being ever treated with penicillin was a London bobby who scratched himself while shaving and developed an ultimately fatal blood infection. He was given penicillin as a last resort, and was well on his way to recovery when the test-tube supply of the precious drug was exhausted. The first life ever saved by penicillin was that of a small boy with a throat infection that would yield to no other medication.

Only a few ounces of the antibiotic had ever been produced when the British, their facilities overburdened by the war, turned to American drug companies for help in developing methods to produce thousands of pounds of it. Not long after, an alert researcher



When an antibiotic has proved effective in exhaustive studies, it is mass-produced in giant tanks for worldwide distribution

Huge rotary filters separate the molds and other materials from the fermentation liquor which contains the antibiotic





Pfizer scientist explains "picture window" in a steer. Through it, researchers can learn what happens during digestive process

Antibiotics not only stimulate growth of animals and poultry, but fight disease. Here a turkey gets Terramycin for sinusitis



in this country was shopping for groceries in a Peoria (Ill.) market when he came across a moldy cantaloupe. Testing the mold, he discovered that, sure enough, it not only produced penicillin, but produced it 200 times as fast as the older strain. This new strain not only saved thousands of lives during the war, but was the ancestor of the penicillin on your druggist's shelf at this moment.

If one mold worked such miracles, would others do still better? Drug companies began testing soil samples from all over the world. For thousands that proved harmful or weak, they found one that showed promise. Streptomycin popped up in a spadeful of New Jersey soil in 1944. This was followed in 1947 by Chloromycetin and aureomycin. Tests of another 100,000 soil samples turned up Terramycin in 1949.

"I guess we've rediscovered streptomycin hundreds of times," says a drug-company official ruefully, recalling hundreds of thousands of discarded soil samples.

When the new drugs proved so effective in guarding human health, they were tried on animals. Today a veterinarian prescribes one of the wonder drugs for an ailing animal as quickly as your family physician prescribes one for Junior's sore throat.

The age of antibiotics in feed, though, came suddenly and almost accidentally. In the late '40s, vitamin B-12 was being studied as a growth stimulant for animals. Both crude and refined forms of B-12 were fed to poultry. Both resulted in growth increases. However, the birds receiving the crude form grew more than the birds on the expensive, refined form. Tests soon showed that the crude materials actually contained small quantities of antibiotics which were not present in the refined material. And it was the antibiotics that stimulated the birds to even greater growth.

One of the finest places to see this agricultural miracle—and mystery—is the 700-acre Agricultural Research and Development Center of Chas. Pfizer & Co., Inc. The world's largest producer of antibiotics, Pfizer was quick to see the potential value of these drugs as growth stimulators. The firm



Egg-breaking machine tests shell's strength. Researchers discovered that Terramycin makes shells stronger

took over an abandoned military hospital at Terre Haute, Ind., and converted it into an experimental farm.

There you can see fat sows nursing their newborn in the comfort of private "maternity" rooms complete with tiled baths. White-robed attendants stride briskly through the corridors taking care of the animals. Each sow has a complete health record posted near the door of her room. All that's missing is the nervous father in the waiting room, and no doubt even he can be found elsewhere on the farm. At any given moment the farm's population may run to 8000 animals, each with an individual number, its own IBM card and a permanent record of what happens to it during its life on the farm.

These animals, for the most part, are used in feed experiments. Steers, for example, are divided into groups. One group is fed normal rations. The other groups are fed rations containing antibiotics, vitamins and "unidentified growth factors" in varying amounts and combinations. Pfizer scientists then interpret the results and come up with recommendations.

"Window" in a Steer

To aid in this research, the scientists are performing minor miracles. They have installed a "picture window" in a steer through which they not only can observe the digestive process, but can take samples at any desired moment. The material is used in another engineering triumph, an artificial rumen. This weird contraption of tubes and hoses precisely duplicates a cow's digestive process. Meanwhile the steer with the porthole continues to live a happy life, apparently quite proud that he is just a little different from the steers in the neighboring stalls.

And what results do they get? Take a look at the figures, not only from the

Pfizer tests but from agricultural colleges and farm feed lots across the country. Beef cattle, fed low levels of Terramycin, grow an average of eight percent faster than the control animals. Their "feed efficiency" (ability to convert feed into meat) also averages eight percent higher. As a result, one study shows that each Terramycin-fed animal paid the farmer \$3.15 more, on the average, than its counterpart on the same rations but without the antibiotic.

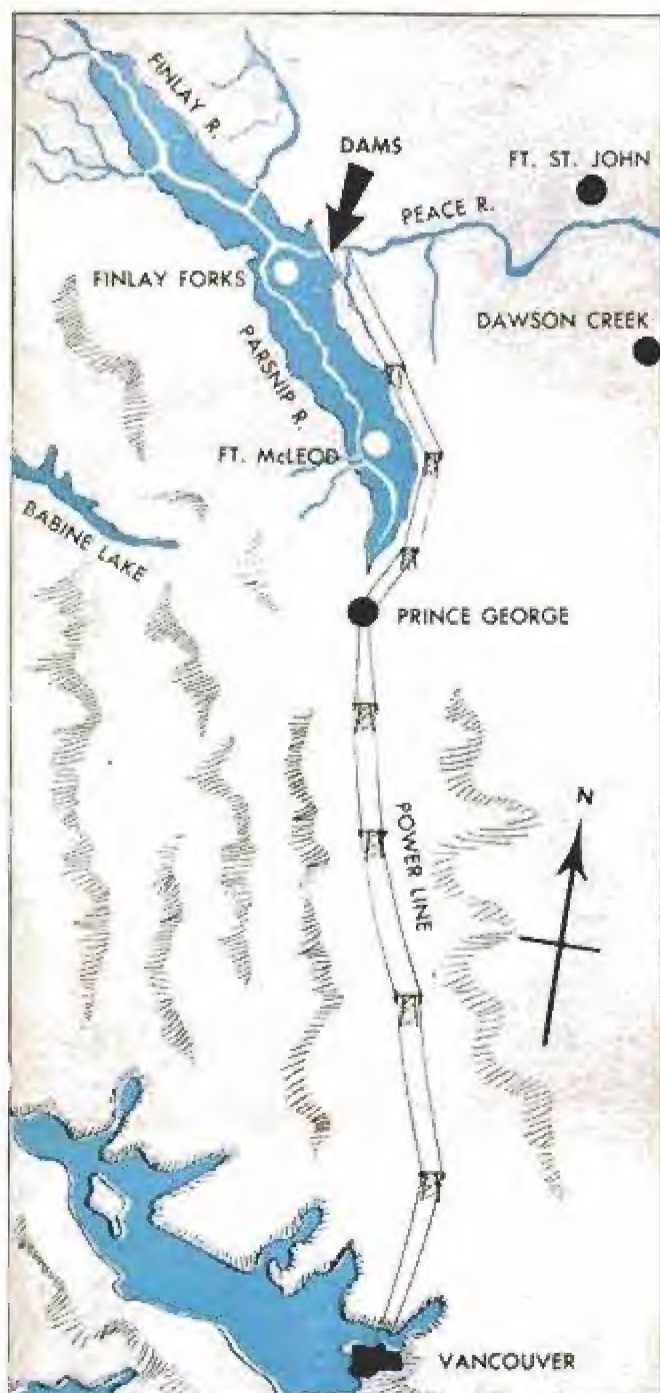
Pigs are given a similar boost up the growth ladder. They grow 10 to 20 percent faster when given a low-level antibiotic supplement, requiring less feed for the same gain. Iowa State College authorities estimate that Iowa farmers, if they properly fed antibiotics to all hogs, would pocket an extra \$20,869,000 a year.

Young calves show an average increase in rate of gain of 20.6 percent on antibiotics. The poultry business shows tremendous progress, part of which can be attributed to antibiotics. Back in 1935 it took 15 pounds of feed and 14 to 16 weeks to produce a three-pound broiler. Today the

(Continued to page 260)

Eggs at top are annual production from an average hen. At bottom are added eggs that can be expected with addition of antibiotic



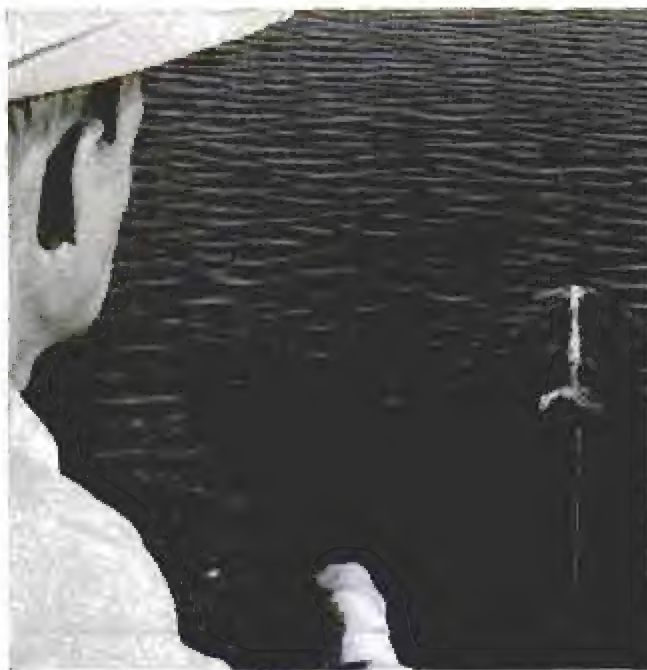


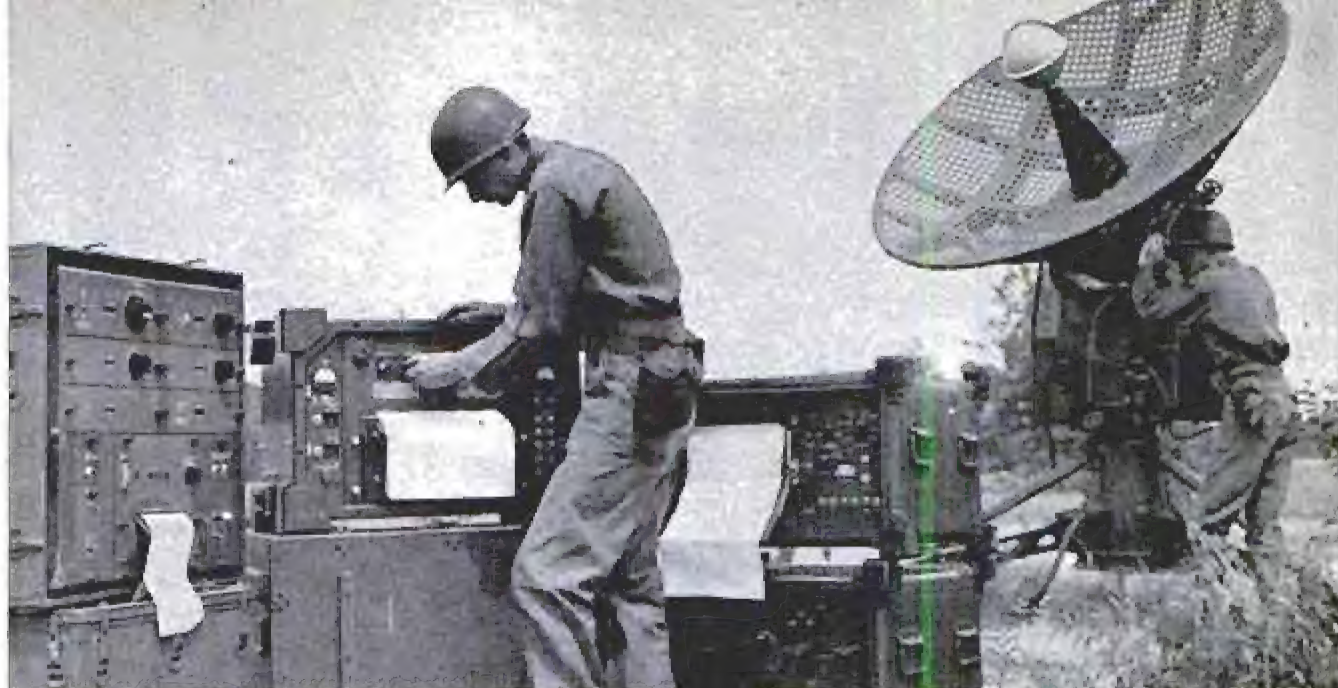
Big Hydroelectric Dams Planned in Western Canada

Among the huge hydroelectric power systems planned in various parts of the world (See "More Power Lights Darkest Africa," page 136) is the Peace River project in western Canada. The plan, promoted by Swedish financier Axel Wenner-Gren, calls for a series of dams on the Peace River, backing up water along the Finlay and Parsnip rivers. The water would form a lake some 260 miles long and up to 15 miles wide. Hydroelectric turbines at the dams would generate nearly 40 percent more electricity than Grand Coulee can produce. The power would be transmitted to Prince George and 400 miles south to Vancouver. From Vancouver it would be distributed into the Northwest Power Pool for consumers in Seattle, Tacoma and other cities of the area.

Propeller Tows Line For Boatless Fisherman

Now you can troll for fish while sitting on a dock. A Montana cowboy, Jacob Mandel, has patented a self-propelled fishing board that will tow one or more baited hooks 250 feet on a relatively quiet body of water. The fishing board is pushed through the water by a propeller driven by a spring-tension pulley. An occasional backward tug on the controlling line restores the pulley tension. The fish can be played "considerably," according to Mandel, although not as freely as would be possible without the fishing board. The hook and line or leader are suspended behind the fishing board so there is nothing between the fisherman and the fish except the line.





Electronic Weather Computer Aids Aiming of Missiles

Aiming long-range artillery or missiles requires accurate information about high-altitude weather. The Army now has a

portable "electronic weatherman" to keep tab on winds and other information. Weather balloons transmit data to the computer.

Plastic May Replace Brass In Cartridge Cases

Brass and steel cartridge cases for artillery shells may be replaced by inexpensive plastic cases. The plastic cartridge cases weigh less than half as much as the steel or brass cases, a factor which would reduce shipping weight by millions of pounds during combat. The plastic cartridges were developed by the Naval Ordnance Laboratory and will be further tested by the Army. The same plastic cartridge cases have been test-fired a half-dozen times to determine their flexibility and durability.



Portable Radar Units Designed for Marines

High-speed enemy aircraft and missiles can be located in 10 seconds by a portable radar unit developed for the Marines. The units will be part of a TEW (tactical early warning) system extending the nation's defense perimeter. A dual-wall "air mattress" radome and equipment can be carried by helicopter, truck or amphibious vehicle and set up in two hours. Only one man is needed to monitor the radar. Miniature parts reduce size of TEW radar to one fourth that of conventional systems.





U. S. Fish and Wildlife Service photos

Red-Tide Organism— Sure Death to Fish



IN THE PHOTO ABOVE, taken during the 1952 outbreak, thousands of fish cover the water, mute evidence of the deadly efficiency of the red tide.

The red tide is caused by a microscopic organism called *Gymnodinium brevis*. The brevis are normally present in sea water, but sporadically they attain killing concentrations. What happens then can be seen in the photos at right. Two mullets about seven inches long are dropped into a tank containing about 21 million brevis. After a futile four-minute attempt to escape the deadly poison released by the microscopic bug, both fish are dead.



Kingfish, the 43-foot floating laboratory for red-tide research, gets under way on periodic patrol to check Gulf water conditions



SEAGOING SLEUTHS PROBE THE MYSTERY OF THE RED TIDE

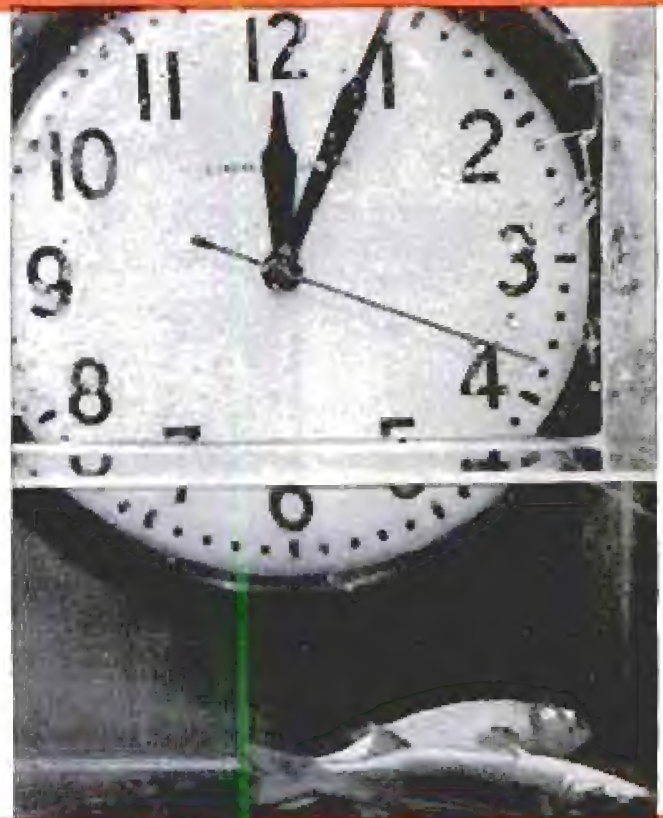
By Max Hunn

STRANGERS VISITING the Crayton Cove docks in Naples, Fla., usually take a second and longer look at a sleek, gray 43-foot cruiser with the lines of a pleasure craft, yet carrying radar antenna and an afterdeck loaded with strange gear.

If they ask questions, they learn it's the floating laboratory of the U. S. Fish and Wildlife Service's red-tide field station in Naples. Despite its pleasure-craft exterior, it carries a variety of special equipment for "detectives" who are solving the spo-

radic fish kills in the Gulf of Mexico, popularly known as the red tide. A red-tide attack hit the Naples area recently; tons of dead fish were washed ashore.

Aboard the *Kingfish*, powered by two 150-horsepower diesel engines, is approximately \$50,000 worth of special equipment, making it one of the most unusual boats afloat. In addition to its 16-mile-range radar, the *Kingfish* carries a depth recorder, LORAN navigation equipment, a conductivity recorder, a hand anemometer, pH





Plastic bottle goes over the side to collect water specimen for analysis in battle against the red tide



Specimens are placed in a quick-freeze unit for trip to laboratory, where they are examined for the brevis

meter for measuring the acidity of the water, thermometers, a ship-to-aircraft voice radio which also reaches the Naples shore laboratory and vessels of the cooperating State Board of Conservation, a 3000-watt diesel generator and a specially built quick-freeze unit.

The *Kingfish*, skippered by Capt. J. D. McCormick, is the major one of four means of collecting hundreds of water samples—the Naples station collects and analyzes 600 to 800 samples monthly—from the 180-mile stretch of the Florida coast between Clearwater on the north and Marathon in the Keys. The *Kingfish* collects the majority of the samples from stations inside the 10-fathom coastal curve, while others are collected by auto from inland points as far away as Lake Okeechobee, and by outboard skiff and float plane in waters too shallow for the cruiser. Although the *Kingfish* draws only 4½ feet—about a foot more

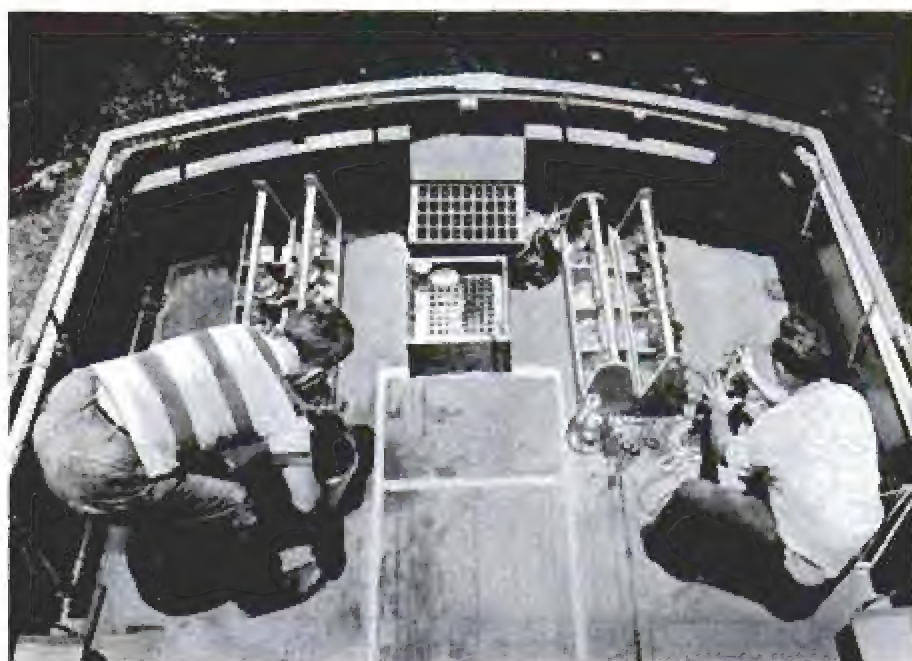
than her design, as a result of the extra equipment—there are many places too shallow for her. There are 380 water-sampling stations.

It takes two weeks to patrol the 180-mile stretch with intermittent cruising. It takes approximately five days to make the southern run from Naples to Marathon and return. The north run, Naples to Clearwater and back, takes a week.

The sampling procedure is the same at each check point. A plastic bucket is used to haul aboard surface-water samples, and an ingeniously rigged plastic jug brings up samples from the bottom. The deep-water samples are obtained by lowering the lead-weighted jug, rigged with a special cork release which opens the container at the proper depth.

Samples consigned to the Galveston laboratory are poured into glass vials

(Continued to page 240)



Water samples are collected in plastic buckets from 300 stations in Gulf. Temperature and acidity of the water are noted, along with wind, weather conditions

Fastest Camera Shutter Records Wire "Explosion"

Exposures of only five billionths second are being made with a camera, claimed to be the world's fastest, which was developed for learning more about intense explosions, ultra-speed shock waves and special nuclear reactions. The accompanying picture, made with the camera, shows three stages in the disintegration of an electric wire $\frac{1}{1000}$ inch in diameter when electric current is applied to it. The three superspeed exposures were made at intervals of 20, 30 and 40 billionths of a second after electricity was applied to the wire.



Number-Reading Machine May Translate Handwriting

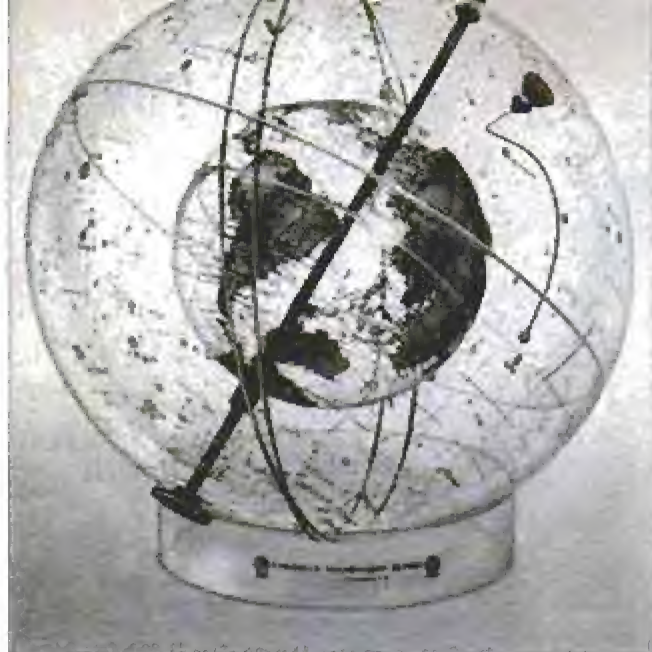
Machines that read handwriting may develop from a device built in the Bell Telephone Laboratories that can identify numbers written on it. The device has a writing surface divided by seven short lines radiating from two dots. When a numeral is written on the surface with a metal stylus, the lines of the numeral cross the vector lines in a pattern which identifies the number. Bell engineers say a four-dot system with 12 vector lines could identify handwritten letters. The machine can be connected to an electronic computer.



Big Steel "Sandwiches" For Lightweight Planes

Large, thin sheets of stainless and alloy steel for missiles and aircraft can be manufactured by a new "sandwich" rolling process. The method consists of sandwiching stainless or alloy-steel plates between two heavier plates of ordinary carbon steel and closing the assembly with welded-in side and end bars. The sandwich is then heated and rolled. U.S. Steel reports that sandwiching can produce steel sheets nearly twice the width of those made by conventional methods. This will result in less weight in aircraft "skins."





Double Globe Shows Orbits

Satellite orbits can be clearly demonstrated on a new earth-sky globe. The earth globe is mounted inside a clear-plastic globe imprinted with a map of the stars. Orbits can be marked on outer globe.



Heat Produces Electricity

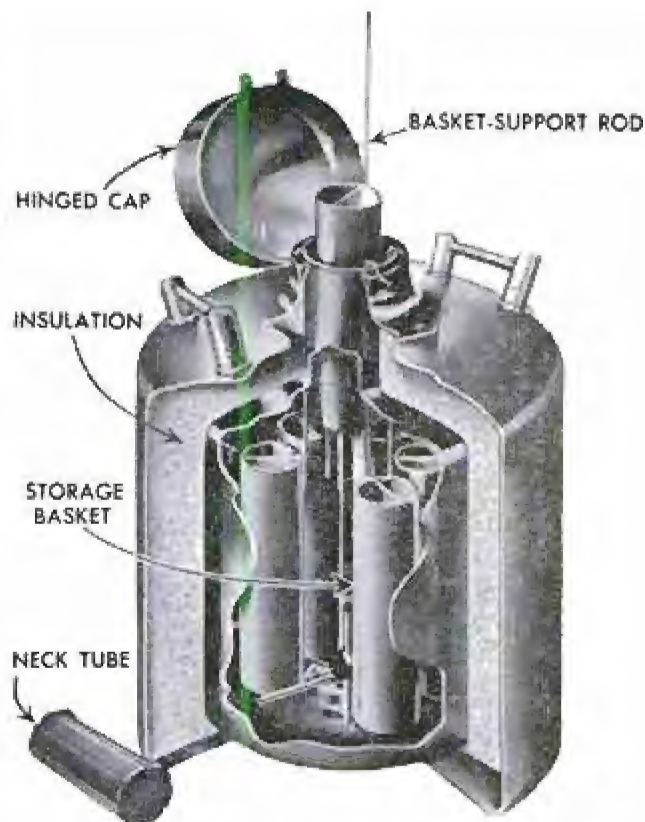
Changing heat into electricity has been achieved with electrodes in a gas-filled tube called a thermionic converter. When the cathode is heated, electrons "boil out" and pass to the anode, producing current.

Auto-Top Boat Sports Electric-Starting Engine and Built-in Radio

Small enough to be carried on top of a car, a new luxury boat built in West Germany is claimed to be the world's smallest

motorboat. The little two-seater is powered by an electric-starting two-stroke engine. Equipment includes a built-in radio.





Liquid-Nitrogen Refrigerator Chills to 320 Below Zero

Developed primarily to store and transport delicate biological materials, such as bacteria cultures and animal glands, a new portable refrigerator is cooled by liquid nitrogen. Materials for freezing or storage are placed in cylindrical baskets which are lowered into the nitrogen. The unit maintains a constant temperature of 320 degrees

F. below zero as long as liquid nitrogen is present in any quantity, and a single charge of the chemical lasts a month. Besides its value as a storage container for biological specimens, the supercool refrigerator can be used to shrink small metal production parts. The parts will expand for a tight fit at normal temperatures.



Campers' Emergency Kit

Planning a camping or fishing trip? You may want to take along a kit that includes signal flares, fishline and hooks, water-resistant matches and other items that would be handy to have in an emergency. The flare gun, not much bigger than a cigar, can be filled, cocked and fired with one hand if necessary. It shoots a brilliant red flare 200 feet into the air. Also available is an aluminum-alloy hand ax with a hollow handle that can be used as a canteen.

Ejection Seat Fires Under Water

Trapped in a flooded Douglas F4D-1 when it plunged into the ocean, a U.S. Navy pilot recently made the first successful under-water ejection, reaching the surface 45 seconds after firing the ejection seat.

More Power Lights "Darkest Africa"

VOLTA RIVER
PROPOSED AJENA DAM

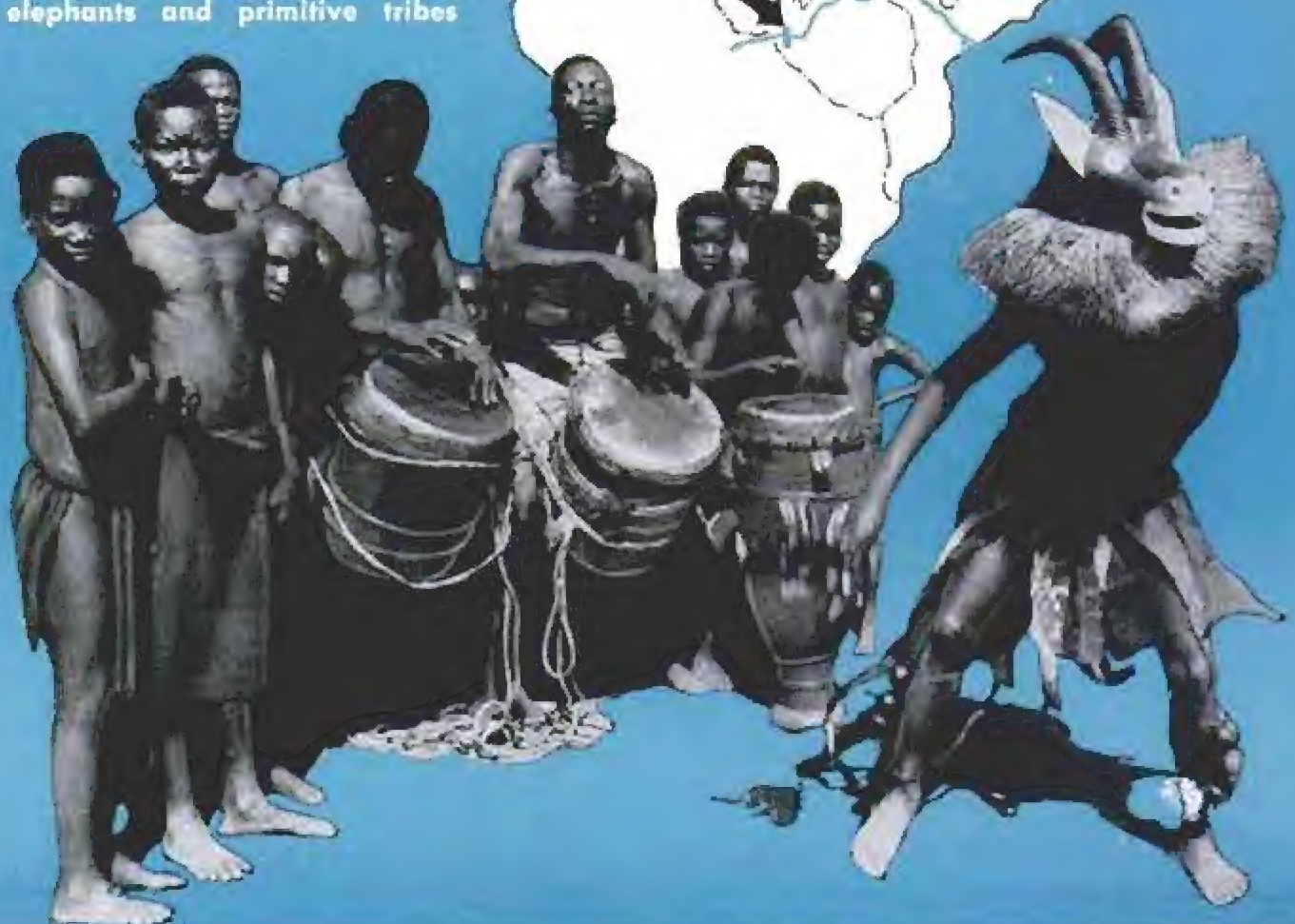
PROPOSED
INGA DAM

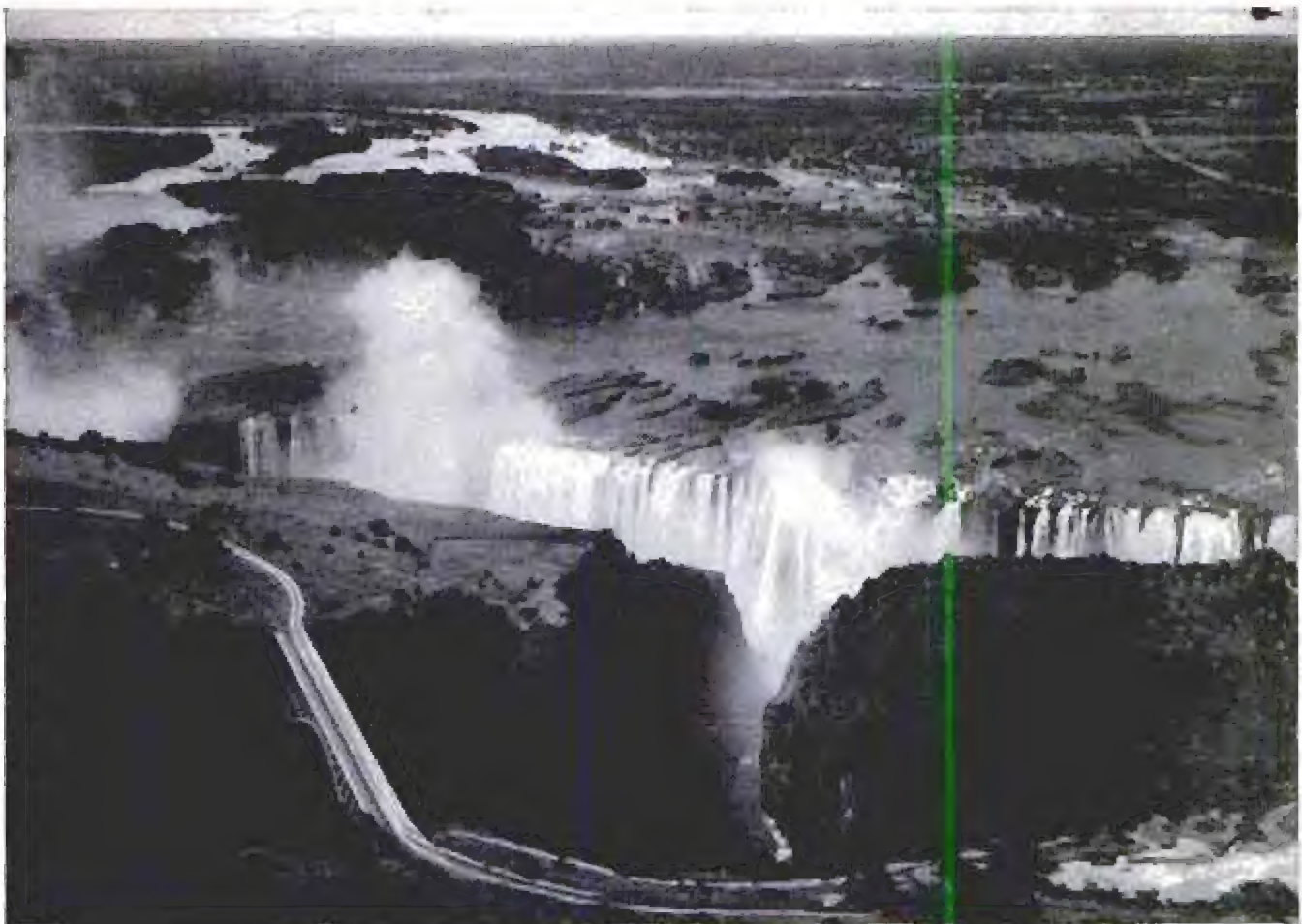
CONGO RIVER

KARIBA
DAM SITE

ZAMBESI RIVER

In the valleys of the Volta, Congo and Zambesi Rivers, regions unknown a century ago, engineers are developing some of the world's biggest hydroelectric dams. Cheap electricity lures modern industries to the land of lions, elephants and primitive tribes





Zambesi River tumbles nearly 400 feet over Victoria Falls, about 220 miles upstream from the Kariba Dam

By Peter Holz

EVER-INCREASING NUMBERS of American businessmen have come to take a look at Africa and taken home the news that the once-dark continent is no longer as dark as it used to be. The bush, the lions and elephants are still there—the American businessmen saw all these, but they saw something else, too. All over Africa the search for oil and minerals is on the increase and industries both small and big are appearing all over the scene.

Unprecedented development is taking place not only in the highly industrialized Union of South Africa, which has always been considered the workshop of Africa, but also in the Central African Federation of Nyasaland and Northern and Southern Rhodesia, as well as in the Belgian Congo and the Gold Coast, now Ghana.

At the time of writing, the largest hydroelectric scheme in the world is being built on the Zambesi River in the Central African Federation. The Belgian Congo is considering an even larger scheme and in Ghana, the Volta River hydroelectric project is being given serious consideration. More and more power is planned for Africa and its 200 million Africans and five million Europeans—power for the advancement of Africa and the free world.

One hundred years ago, central Africa

Shaving away the side of a mountain in the Belgian Congo uncovers deposit of tin, one of the valuable minerals of the African colony. Engineers plan a multibillion dollar hydroelectric and industrial development project in the Belgian Congo, near Inga



FIRST STAGE of Kariba Dam construction shows thin arch cofferdam erected on left bank of the Zambesi River during low-water season. Dotted line indicates diversion tunnel built at the same time on right bank



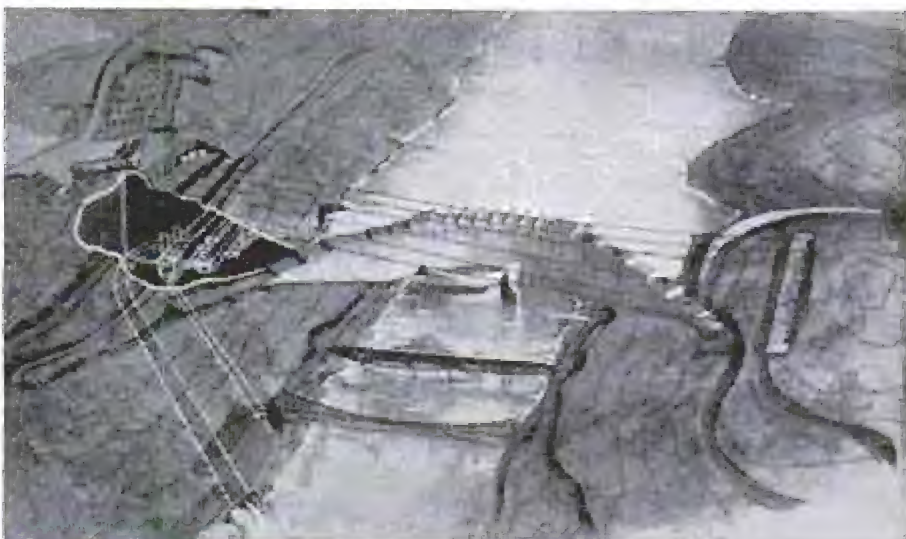
SECOND STAGE shows part of main dam erected within cofferdam as right flank is started above water level. Temporary bridges are built below dam. Contour lines in drawings show 50-foot differences in elevation



THIRD STAGE, during second low-water season, allows new cofferdams to be built around site of main dam section. Left-flank cofferdam is demolished. Water is forced through diversion tunnel as excavation is begun to extend dam into banks



FOURTH STAGE, scheduled for third low-water season, shows original diversion tunnel closed and dam wall rising. Power-house intakes and other facilities for first two turbines are shown in cutaway of right bank





Kariba Dam as it will appear when completed. Water from Zambesi will be diverted into turbines through intakes and tailraces, indicated by dotted lines. Road crosses top of dam

was practically unknown to Europeans except a handful of explorers. Today, more than a quarter million Europeans call the Central African Federation their home. Large towns have sprung up and, with them, industries. The standard of living of the seven million Africans in the Federation has been appreciably raised by the white man's knowledge and enterprise.

Since the end of the war, production of minerals such as copper, lead, gold and chrome—as well as asbestos and zinc—has increased considerably. Coal, however, is not plentiful and to offset a future crisis in the second largest copper-mining industry in the world, the Kariba hydroelectric scheme was planned.

Thousands of Europeans and Africans are at work on this project which by 1960 will change the face of Africa. The Kariba Dam, spanning the Kariba Gorge through which the Zambesi flows, will create the largest manmade lake in the world with a shoreline of 800 miles, and a surface area

of more than 2000 square miles. The amount of water in it will be more than four times that of Hoover Dam's Lake Mead, now the largest manmade lake.

Naturally there are people, primitive Africans, who call this vast area to be inundated, their home. About 25,000 of them are being evacuated to an area specially set aside for them. As compensation for being moved from their ancient tribal lands, the whole tribe will be allowed a tax-free period of two years, a six months' supply of free food and other benefits.

Originally the total cost of the Kariba hydroelectric project was estimated to be \$240,000,000. Latest estimates put the figure at \$330,000,000. Some of the money comes from the World Bank, some from the copper mines which will use electricity generated at Kariba, and some from the Colonial Development Corporation.

Initially six generating units will be installed at Kariba, but the power will be increased by the installation of 10 more

Boiling waters of Zambesi lap at Kariba Dam bridge supports during 1957 flood that submerged cofferdam





Copper mine in Belgian Congo would be part of hydroelectric industrial project proposed for this colony

generating units as demand increases. Electricity will be delivered by transmission lines joining Kariba with networks in Northern and Southern Rhodesia.

Power will be transmitted at 330,000 volts through steel-cored aluminum conductors. Although the Federation is the second-largest producer of copper in the world, the use of copper for conductors was ruled out because of price.

A township for European workers and their families is springing up near the dam on an area of about 130 acres. A hotel, church, meeting hall, swimming pool, tennis courts, a primary school, shops and

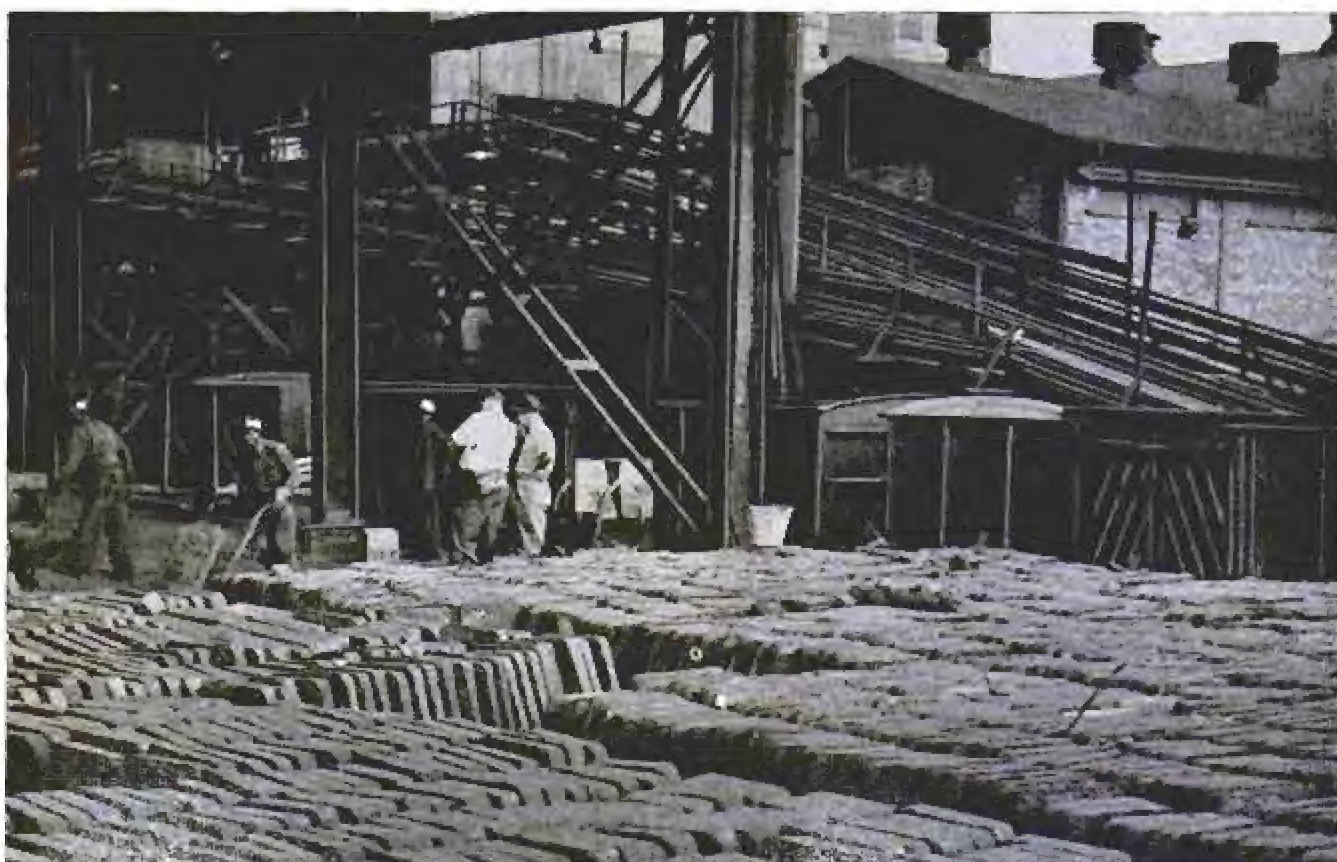
other facilities are also being constructed. African quarters, too, are being built.

The concrete-arch dam which is really the kingpin of the whole project will, when complete, rise to a height of about 420 feet above the foundations. The length of the dam along the roadway will be about 1900 feet. About 1,200,000 cubic yards of concrete will be poured.

In the center of the dam wall will be a spillway 306 feet long divided into eight sections, each with a gate 38 feet long and 26 feet high. The spillway has been designed to handle 300,000 cubic feet of water

(Continued to page 232)

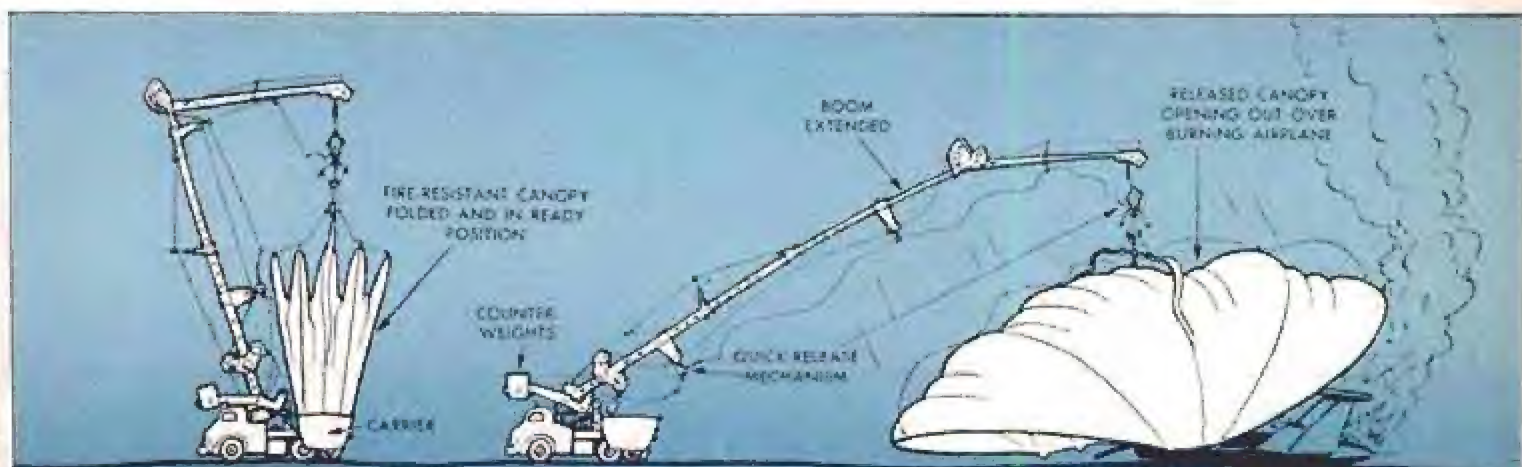
Blister copper loaded on railroad cars in Northern Rhodesia, near site of the Kariba hydroelectric dam





Giant Snuffer to Put Out Aircraft Fire

BASED on the same principle as a candle snuffer—but big as a tent—is a device proposed for dousing aircraft fires. At the sound of a crash warning, a truck bearing the collapsible snuffer is rushed onto the airfield. If fire breaks out, the snuffer is hoisted by a boom attached to the truck and dropped over the burning plane to cut off the supply of oxygen. Also helping to smother the flames are chemical sprays on the underside of the fire-resistant canopy. Asbestos-clad firemen rush in to rescue the crew. The three Spanish inventors, shown with the model at right, suggested the idea while students at the School of Aviation Medicine, Randolph Air Force Base, Tex.



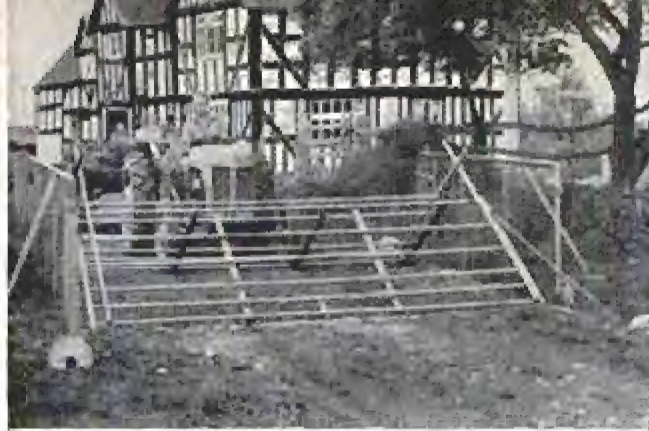


Huge Centrifuge Tests Missile Parts

BUILT TO TEST components of the Atlas intercontinental ballistic missile, a big centrifuge at the Convair Astronautics test laboratories can whirl a one-ton load at

121 revolutions per minute. The machine develops enough energy to loft a golf ball from San Diego, Calif., to a point in the Atlantic Ocean 700 miles beyond New York.





British Livestock Gate Opens Automatically for Vehicles

There's no need to stop your tractor or truck when you approach a livestock gate used by British farmers. The grid gate

folds flat when the front wheels touch it. Counterweights raise the gate again as soon as the vehicle has passed.



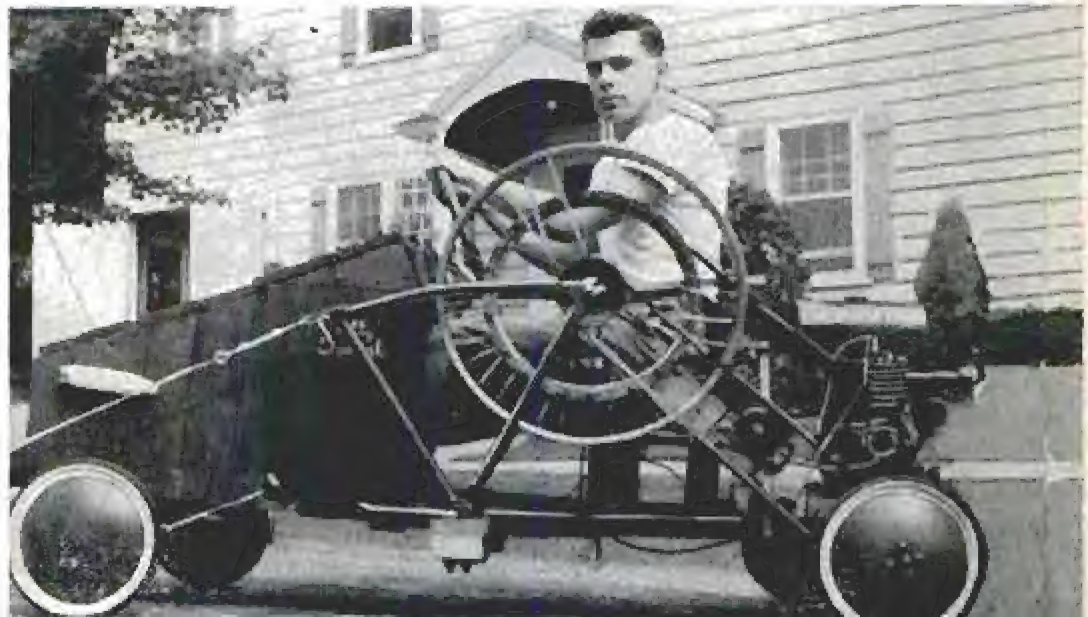
Electric Water Heater Uses Snap-On Heating Units

Elements for a new kind of electric water heater can be replaced in a few seconds, without disconnecting the heater. The

series of individual 250-watt segments is joined to the bus bars by spring clips. Failure of one unit does not affect the others.

Soapbox Racer Becomes Motorcar

Using a two-horsepower engine from a milking-machine compressor, Arthur T. Stultz of Burlington, Vt., has converted a soapbox racer to a motorcar that can go 20 miles per hour. A system of V-belts and an old bicycle wheel gives the vehicle a gear system with a power ratio of approximately 15 to 1.





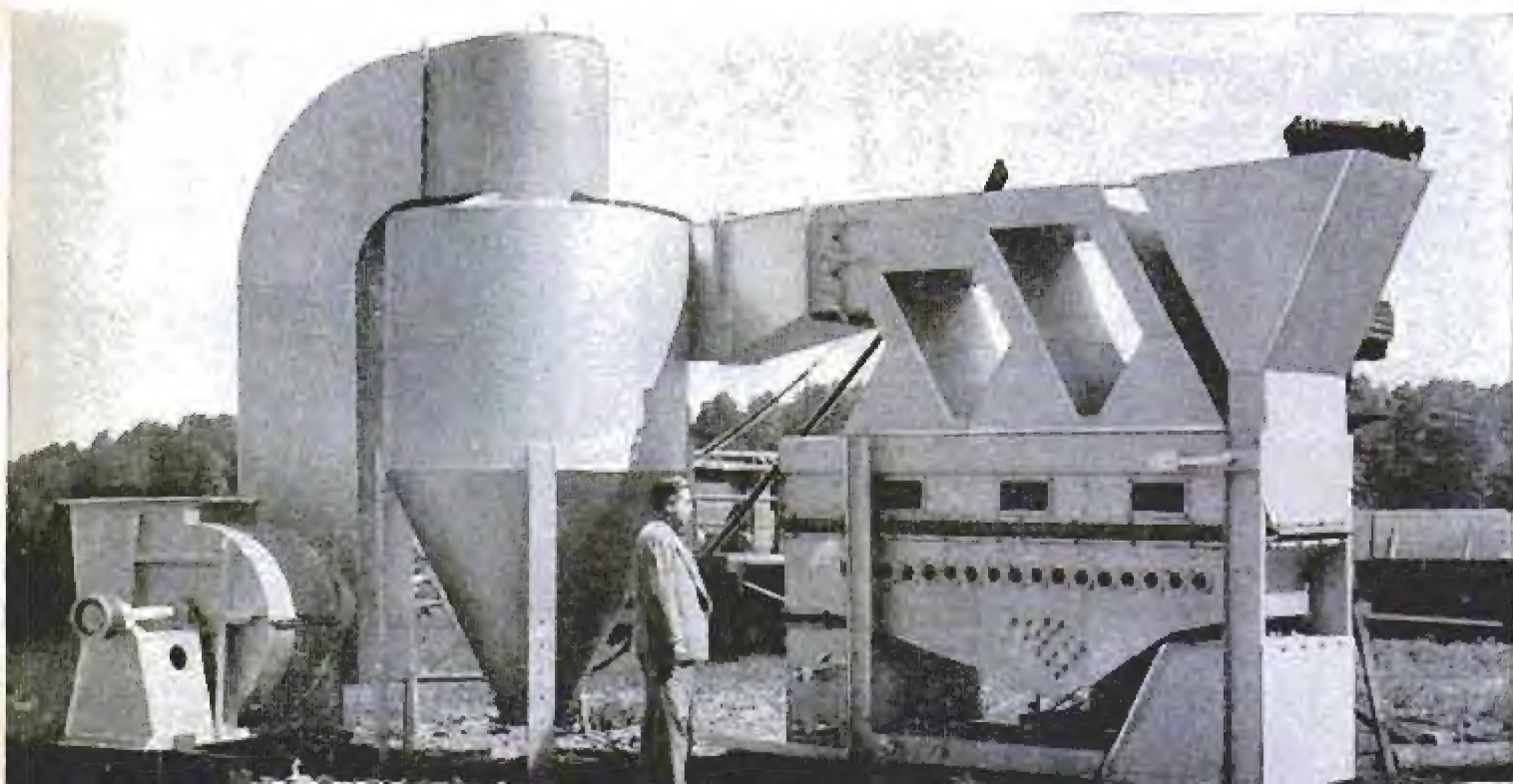
Divers Can Chat On "Sonar" Phone

Divers are able to talk back and forth under water by using a new device that is based on the principle of sonar. Known as an underwater voice projector, it allows divers to converse almost as plainly as in the open air. The apparatus consists of a microphone that is embedded in the diver's breathing apparatus, a battery, a transistorized amplifier and a metal diaphragm that is worn on the chest. The diaphragm, actuated by a ceramic ring that changes dimensions by electrostrictive action, projects the sound waves through water. Reception is principally by bone conduction instead of by the eardrums. A diver who is listening must be bareheaded, or must wear a stethoscope type of pickup encased in a full diving suit and metal helmet. The present diver-worn projector, built by the Navy Electronics Laboratory at San Diego, Calif., has a range of 100 yards.

Waterless Coal Washer Cleans by Air Pressure

Hailed as a waterless coal washer, a huge machine invented by Emery O. Milligan of Marion, Ill., and Ralph J. Lofquist of Chi-

cago cleans coal by air. The device forces air under pressure through the coal. It will be manufactured in southern Illinois.





Leather From Salmon Skin

Looking for new materials for interior decor or handicraft? Now you can buy leather made from the hides of Alaska Chinook or king salmon. The natural surface of the hide has a fish-net pattern. The processed hides are available in five colors.



Helicopter Shakes Nut Trees

Pecan growers in Texas and Georgia are experimenting with the use of helicopters to harvest the crop. The copter hovers over a tree for two or three minutes while the wind from the rotor blades flails the limbs, shaking the pecans onto the ground.



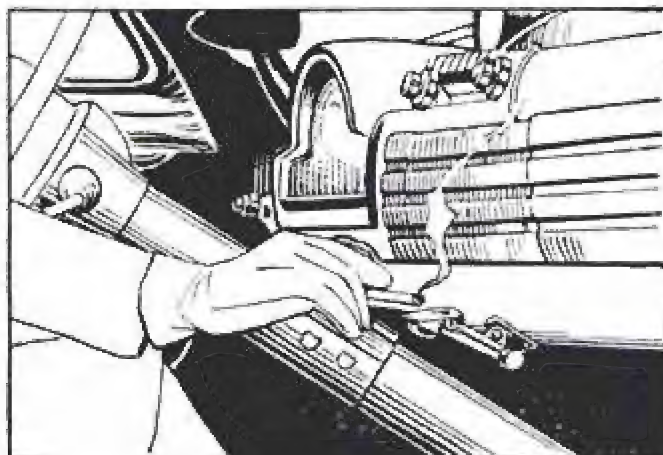
Will Space Men Mine Meteors?

Prospectors in outer space may someday mine rare metals and gems from the thousands of meteors circling the earth. According to missile and space experts, including Dr. Ernest Stuhlinger, head of the U. S. Army ballistic-missile program at Huntsville, Ala., it may be possible to land on and mine a large meteor, or scoop smaller ones into a spaceship. The small meteors, which normally burn up when they enter the earth's atmosphere, are almost pure gold, silver, platinum, iron, copper and other metals. Diamonds, the purest form of carbon, are also prevalent.

Dashboard Ash Tray Empties by Vacuum Into Container Under Hood

Touch a button on the side of a new ash tray for cars and the cigarette stub is drawn by vacuum through a tube to a glass

container under the hood. The vacuum extinguishes any sparks and the container needs to be emptied only four times a year.

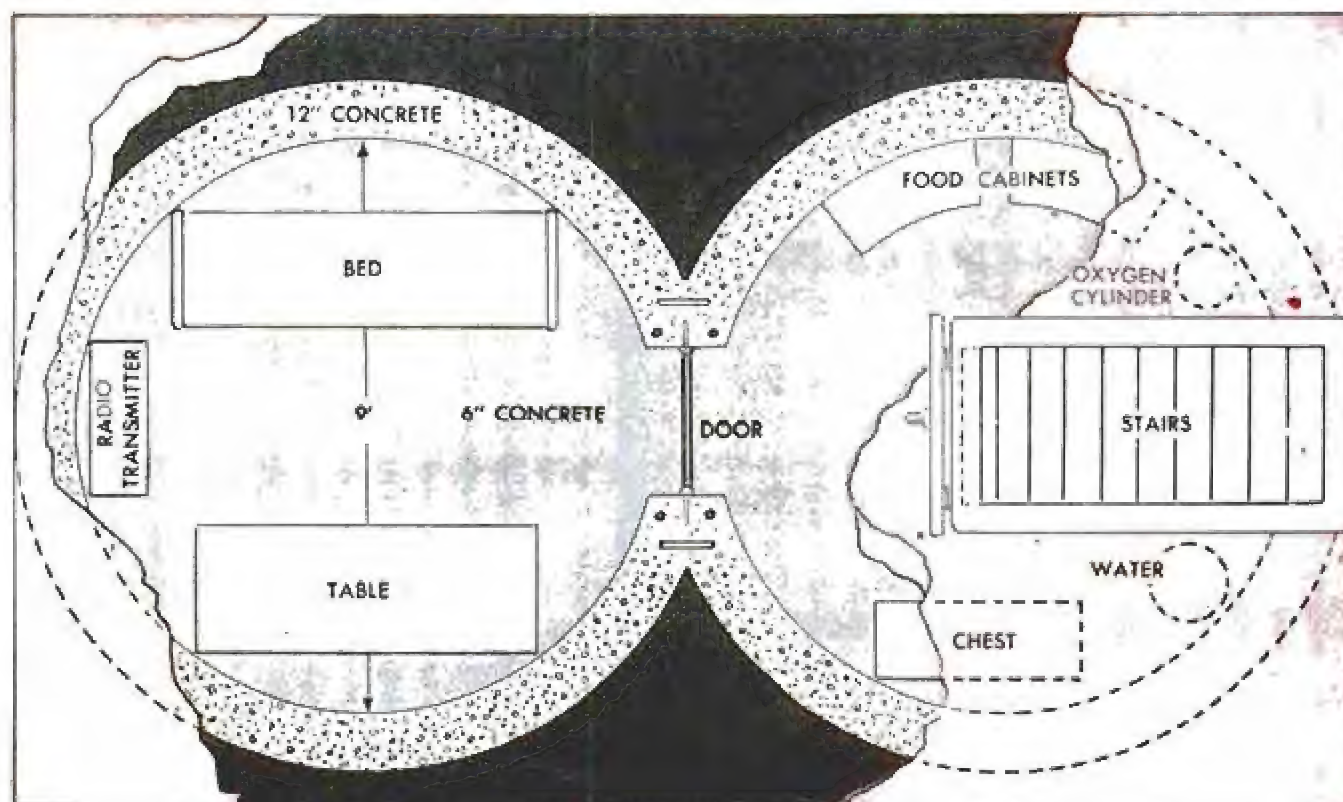




William A. Rhodes, left, demonstrates the radio transmitter in his snug underground atomic-bomb shelter

Atomic Hideouts

Shelter has two circular rooms nine feet in diameter; one serves as storage area, the other for living



LIFEBOATS ON THE DECK of an ocean liner do not necessarily mean that the captain expects the ship to go down. This same reasoning, according to the builder of an atomic-bomb shelter in Phoenix, Ariz., should be applied to the building of such shelters across the nation. William A. Rhodes, research physicist, is no prophet of gloom; but he believes that an underground shelter that can be built for \$400 is pretty cheap family insurance against an H-bomb war. The concrete shelter he recently finished building has received the blessing of the Phoenix Civil Defense authorities who proclaim it to be an excellent type of family bomb shelter. In fact, they have urged others to build shelters of similar style.

The importance of some kind of shelter was stressed in the Gaither report made for the Office of Defense Mobilization and the National Security Council. Among other measures the report recommended "a Civil Defense shelter program at a cost of around \$5,000,000,000 a year for four to five years. The shelters would be designed to save lives against the perils of radioactive fallout and only incidentally to help the nation's industry to recuperate after an enemy attack."

Many Civil Defense workers and people like William Rhodes feel that it is a mistake to wait for a federal shelter-building program. After all, such shelters might be miles from your home. Also, approaches

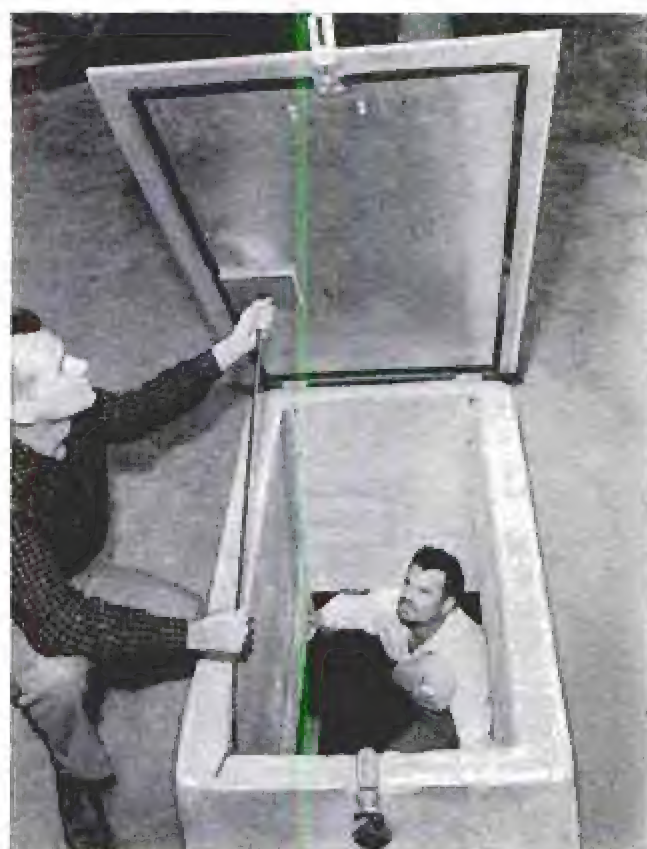
to the shelters might be jammed after an alert that enemy bombers or an intercontinental ballistic missile was on the way.

The simple shelter built by Rhodes in his back yard was designed to afford protection for himself, his wife, and their son, for a period of two weeks. It might accommodate one or two more persons with the addition of an extra oxygen tank.

The Rhodes shelter consists of two adjoining circular rooms; each is nine feet in diameter. The reinforced-concrete floor is six inches thick and the walls are one foot thick. I-beams support the ceiling which is 6½ feet in height. The entrance is through a hatch which is slightly above ground level with wooden stairs that lead down into the shelter. The first room contains storage cabinets for food and clothing, a water tank and oxygen cylinder. In the inner room are a bed, table, chairs, lounge (which could serve as a bed for the son), a desk, cabinets, and a ham radio transmitter and receiver. A transmission antenna juts upward from the shelter and its supporting pipe provides a channel for electric lines and air intake.

Temperature in the shelter varies from 62 to 78 degrees throughout the year. High humidity from irrigation seepage requires the occasional use of a dehumidifier; a small electric heater is used sometimes for 10-minute periods. In addition to its use as a bomb shelter, the underground rooms provide the Rhodes family with a cool

Transmission antenna for radio transmitter extends through roof of shelter. Hatch is in the background





Laszlo's luxury shelter is designed for safety under all conditions except for a direct hit by an H-bomb

place in which to relax during the hot summer weather.

In contrast to the Rhodes project, a deluxe bomb shelter in Los Angeles provides comfortable quarters for eight persons for two weeks. Its maximum capacity is 14 persons. The shelter is engineered to provide safety under all conditions except for a low-altitude direct hit by a hydrogen bomb. It was designed by Paul Laszlo, industrial designer of Beverly Hills, Calif., in collaboration with authorities on blast, thermal conditions and fallout. Comfortably supplied with food, water, electricity and filtered air, shelter's occupants would be in touch with the world by short-wave radio. A Geiger counter with a protected tube located above ground would tell the occupants when surface contamination was reduced to a safe level.

The shelter consists of complete living quarters, including galley and toilet built inside a 10-foot-diameter galvanized pipe with waterproof joints. The pipe is buried under four feet of compacted earth. In addition to a main entrance with spiral staircase and elevator, a remote escape hatch is

also provided. The self-sealing entrance doors are designed to withstand pressure differentials of 30 pounds per square inch. The ground surface around the main entrance sweeps up so as to carry blast pressure past, reducing pressures inside the entrance area to subsonic velocities. A metering orifice in each ventilating duct keeps pressures inside the shelter within safe limits. Dust filters that would trap radioactive dust are contained in the ducts.

The shelter has its own electric generator that starts up automatically if city power is disrupted. In case of generator failure, the lights and ventilating system automatically switch over to batteries that could operate the equipment for a week.

A large underground emergency-water tank, connected to the city mains, is equipped with a valve that closes after an explosion to prevent the water supply for the shelter from being contaminated with radioactive water. Bottled water is stored in the galley. Storage space under the floor contains survival tools including oxygen tanks and masks and acetylene cutting equipment. ★ ★ ★

Black-and-White Prints From Color Negatives

With the development of a panchromatic enlarging paper, photographers can make good quality black-and-white prints from color negatives. Conventional enlarging papers, due to their lack of red sensitivity, reproduce reds as black. The new paper, announced by Eastman Kodak, yields faithful black-and-white prints without using corrective filters, although filters may be used for special effects.

Dinosaurs and Man

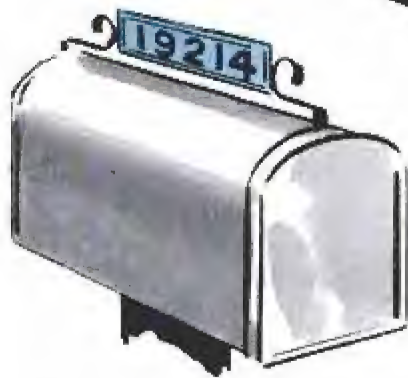
Dinosaurs were the dominant animals on earth for about 130,000,000 years; man and his forerunners have been here less than 2,000,000 years and all human history covers little more than 10,000 years, according to the Smithsonian Institution.

☞ Cloud-seeding on the West Coast has resulted in an average precipitation increase during seeded storms of 5 to 22 percent, according to the President's Advisory Committee on Weather Control.



Numbers System Helps Fight Fires

Because many people panic during a fire and fail to report the exact address of the blaze, firemen of Hartford Township, Ohio, have assigned a special "fire number" to each household in the area. A copy of this number is kept at the base of the telephone and the same numbe



appears on the mailbox. Now, when a person reports a fire, he merely reads his fire number to the fire department. From the department's file, firemen pull a card listing the address, number of persons in the family, location of master switch, nearest water supply, hazards such as a mean dog or stored gasoline and other information helpful to fire fighters.

"Piggyback" Trailer Unit for Standard Pickup Truck Sleeps Three

Sleeping room for three is available in a "piggyback" camping unit that weighs only 800 pounds and fits into any standard pickup truck. It provides many of the facilities of a house trailer but does not require the extra license plates, tail light and slow speed of a conventional mobile home. It

can be driven and parked anywhere you can take a passenger car. The unit is installed or removed by sliding it on pipe rollers up or down a ramp. It is completely insulated, has a birch-paneled interior and a skylight vent in the roof. A unit for the Ford Ranchero pickup sleeps four.

Interior has seats that fold into double bed, gas range, electric lights, ice box, water tank, sink

Exterior shows snug fit in pickup body, with no overhang. Third bunk is in extension over the cab





WHAT'S NEW FOR Your Home

← **PORTABLE AIR CONDITIONER** also serves as a room heater or dehumidifier. Using the heat-pump principle, unit can be rotated, back to front, in the window to warm room air. Placed on the floor it becomes a dehumidifier. Unit weighs less than 60 pounds, fits most windows

Carrier Corp., Syracuse 1, N.Y.

"UTENSIL WHEEL," right, hangs from the ceiling to hold pots and pans over "island" working centers in modern kitchens. A push of the housewife's finger rotates wheel on ball-bearing mount to bring the desired utensil within reach

Arch Co., 31 Milk St., Boston 9, Mass.



NYLON HOSE SHAKER, below, uses centrifugal force to wash and dry nylons within minutes. Nylons and detergent solution are placed in container, which housewife then shakes for a few moments. After rinsing the hose, she swings container at arm's length. Centrifugal force dislodges water, leaves hose virtually dry

P. F. Fleming, 1202 Commerce Bldg., Houston 2, Tex.



BURGLAR ALARM, below, requires no electricity, locks partially raised windows against further opening. Bell itself is turned to wind up alarm. "Ears" fit against sash and casement. Raising the window trips trigger beneath bell

Allied Associates, P.O. Box 48, Dexter, Me.





HEAT EXCHANGER, mounted between furnace and chimney, warms basement with heat that otherwise would escape. Thermostat controls fan which blows air through tubes to recover heat

Airrite Mfg. Co., Emporium, Pa.



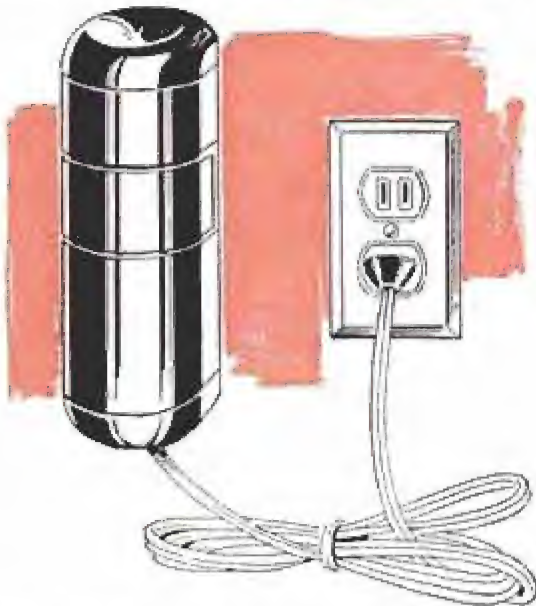
"THIRD HAND" holds mirror while milady dresses her hair. Mirror measures seven by eight inches, has a watertight plastic frame. Flexible arm can be mounted on any wall, permitting mirror to be adjusted in height and angle

Magie Vu Inc., 1150 S. Broadway, Denver, Colo.



RACK FOR IRON holds it off the ironing board to minimize fire hazard. Adjustable clamps hold the rack to the board. Rack holds both open and closed-handle irons

Fleming Mfg. Co., 3240 N.W. 27th Ave. (Room 47), Miami, Fla.

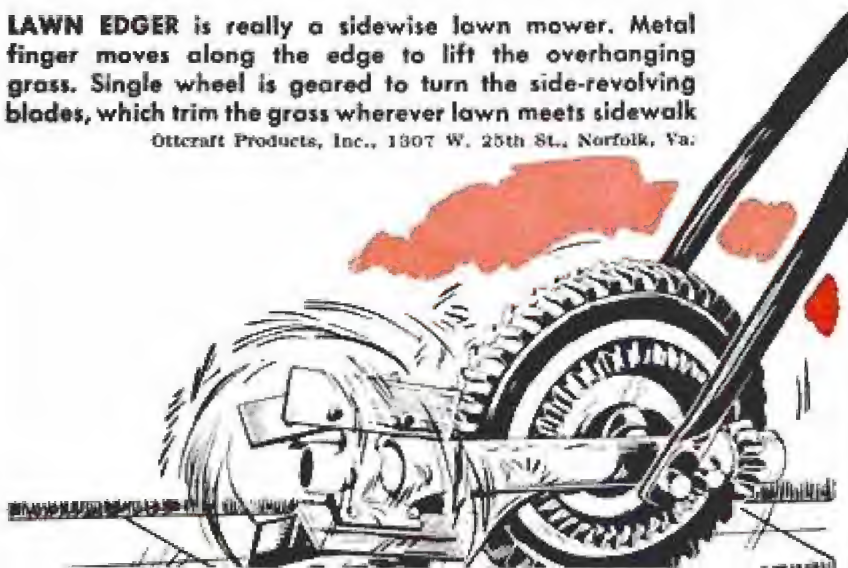


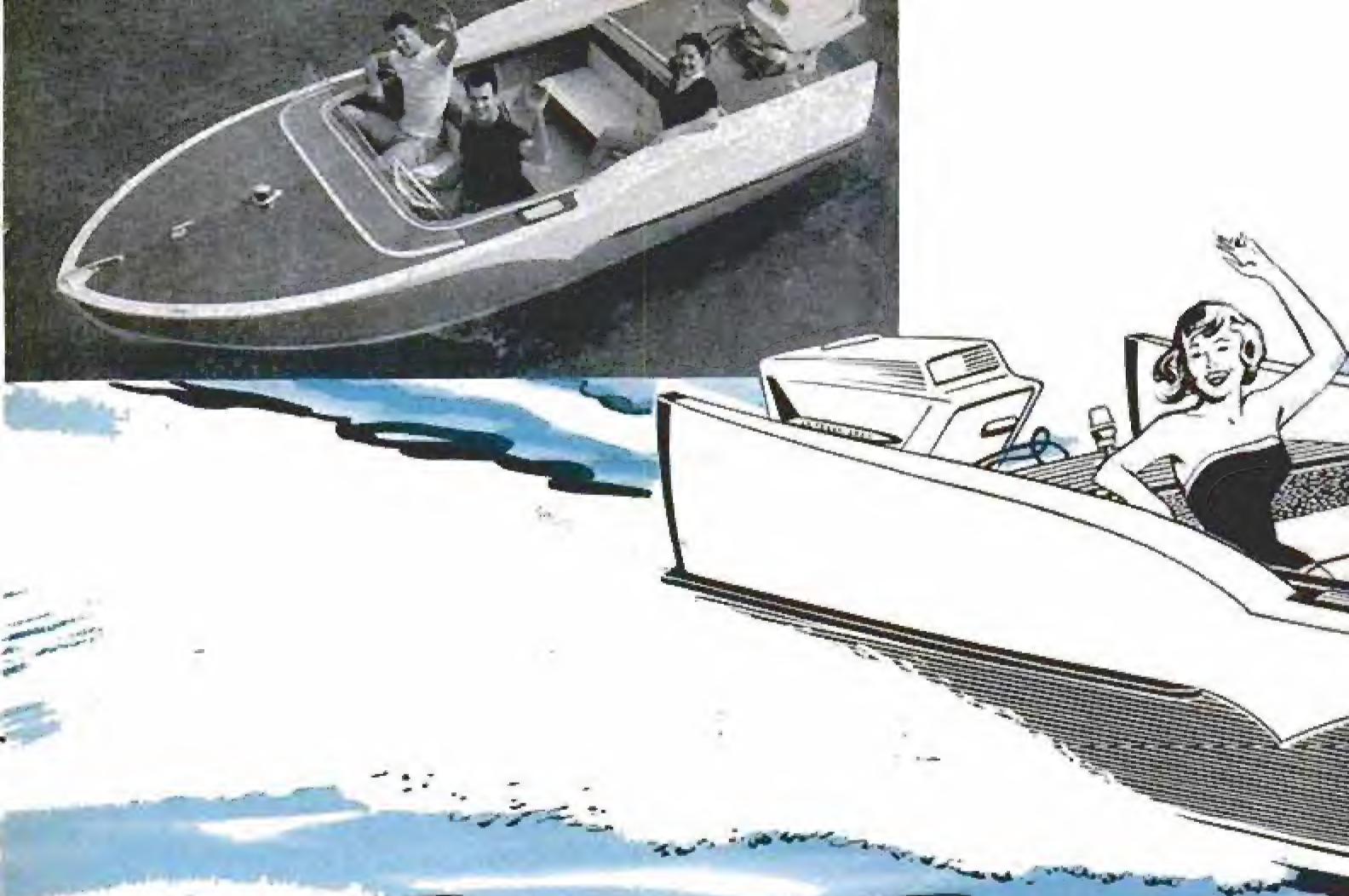
HEATING ELEMENT, installed in closets or cabinets, prevents mildew. The element is encased in a steel cylinder open at both ends. Damp air goes in the bottom and is dried as it moves up tube

Air Dri Associates, P.O. Box 411, Station A, St. Petersburg, Fla.

LAWN EDGER is really a sidewise lawn mower. Metal finger moves along the edge to lift the overhanging grass. Single wheel is geared to turn the side-revolving blades, which trim the grass wherever lawn meets sidewalk

Ottercraft Products, Inc., 1307 W. 25th St., Norfolk, Va.





"SWISH"

15-FT. SPORTS RUNABOUT

PART I

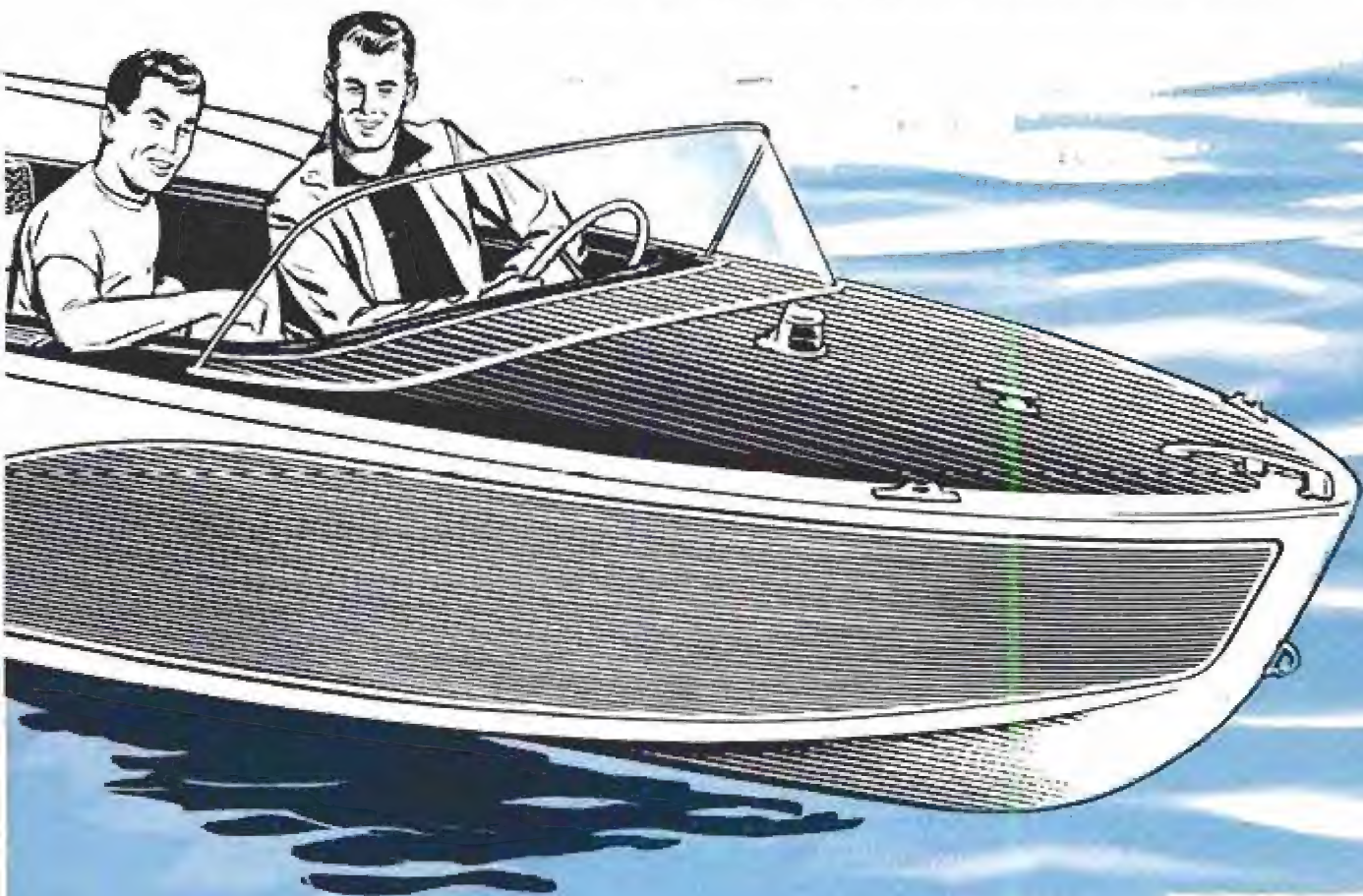
FOR THE OUTBOARD ENTHUSIAST who desires a really fast boat with an ultramodern appearance, here is *Swish*, a 15-ft. 2-in. sports runabout designed especially for *PM* readers by Glen L. Witt, naval architect. Although unusual in design, construction of the boat is basically simple so that anyone familiar with a few common tools can build her with little difficulty. An extreme beam of 6 ft. 4 in. and a maximum hull depth of 30 in. provides for a roomy cockpit in which comfortable front and rear seats are installed for enjoyable riding. The rear seat is removable to accommodate fishing, water skiing or skin-diving equipment when desired. The high sweeping tailfins not only make the boat attractive but stiffen the hull and de-

flect spray to keep the motor and rear-seat passengers dry.

All materials, lumber and fittings required for construction of the boat are itemized in the materials list on page 252. Materials not listed may be substituted at the discretion of the builder, provided they are of similar quality and have about the same characteristics. Where lumber is specified, white oak, Philippine mahogany or Sitka spruce can be used as desired, keeping in mind that for strength oak is preferable, for appearance mahogany is best, and for good strength and light weight, spruce is advised. All plywood used must be intended for marine or exterior use. Plywood edge-stamped EXT-DFPA will assure the builder of guaran-

BOATING . . .

Swish, one of the trimmest family runabouts ever designed for the craftsman, leads off our annual boating section. Among other articles in these 29 pages, boaters will find a report on new boating products, a shantyboat vacation cruise, all the 1958 motor specifications, tips on buying used boats, radio aids for boaters (page 220) and a scientist's answer to that old question, "Do Motorboats Scare Fish?"



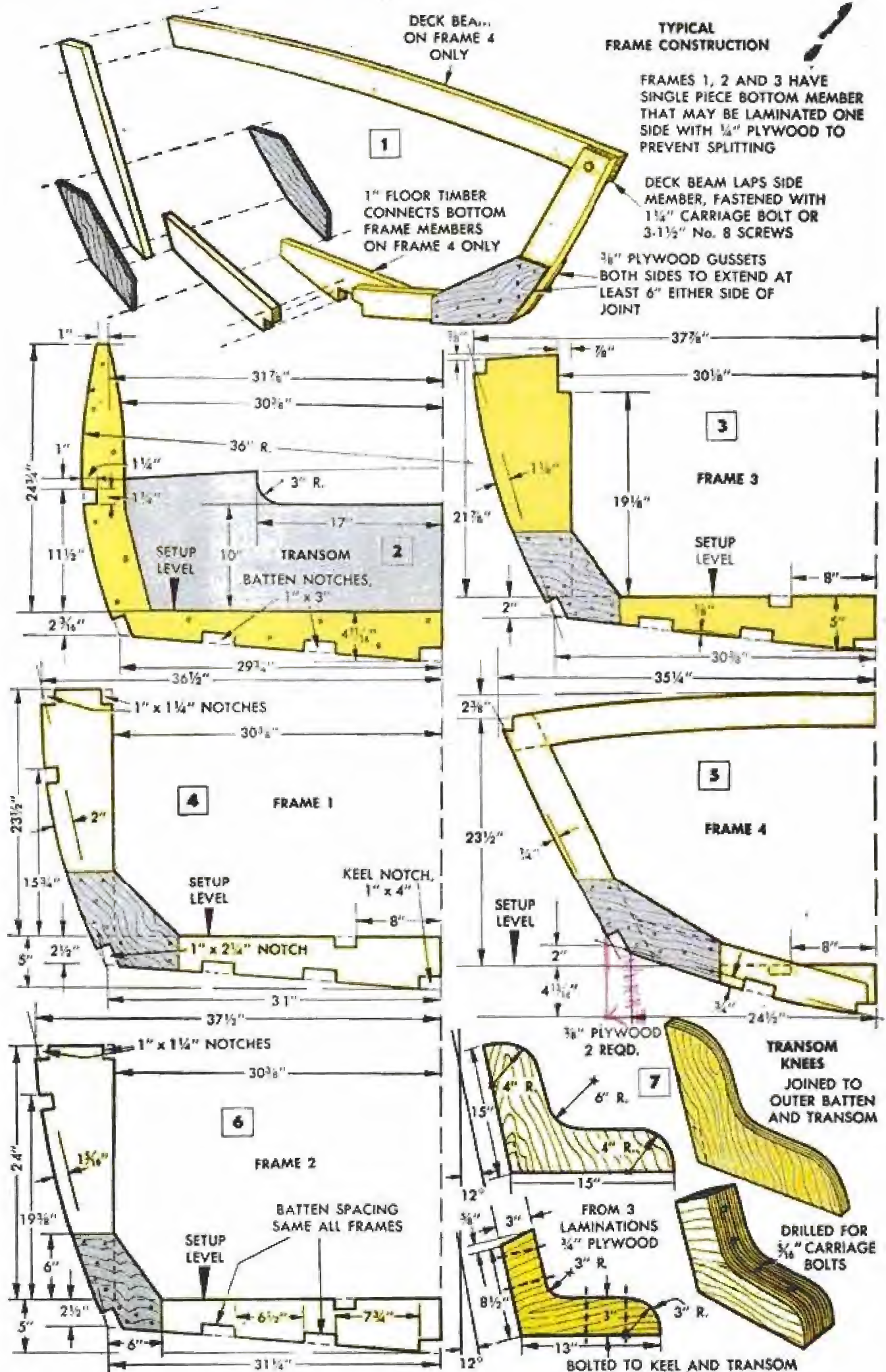
High sweeping tailfins and spray rails deflect spray to keep motor and rear-seat passengers dry

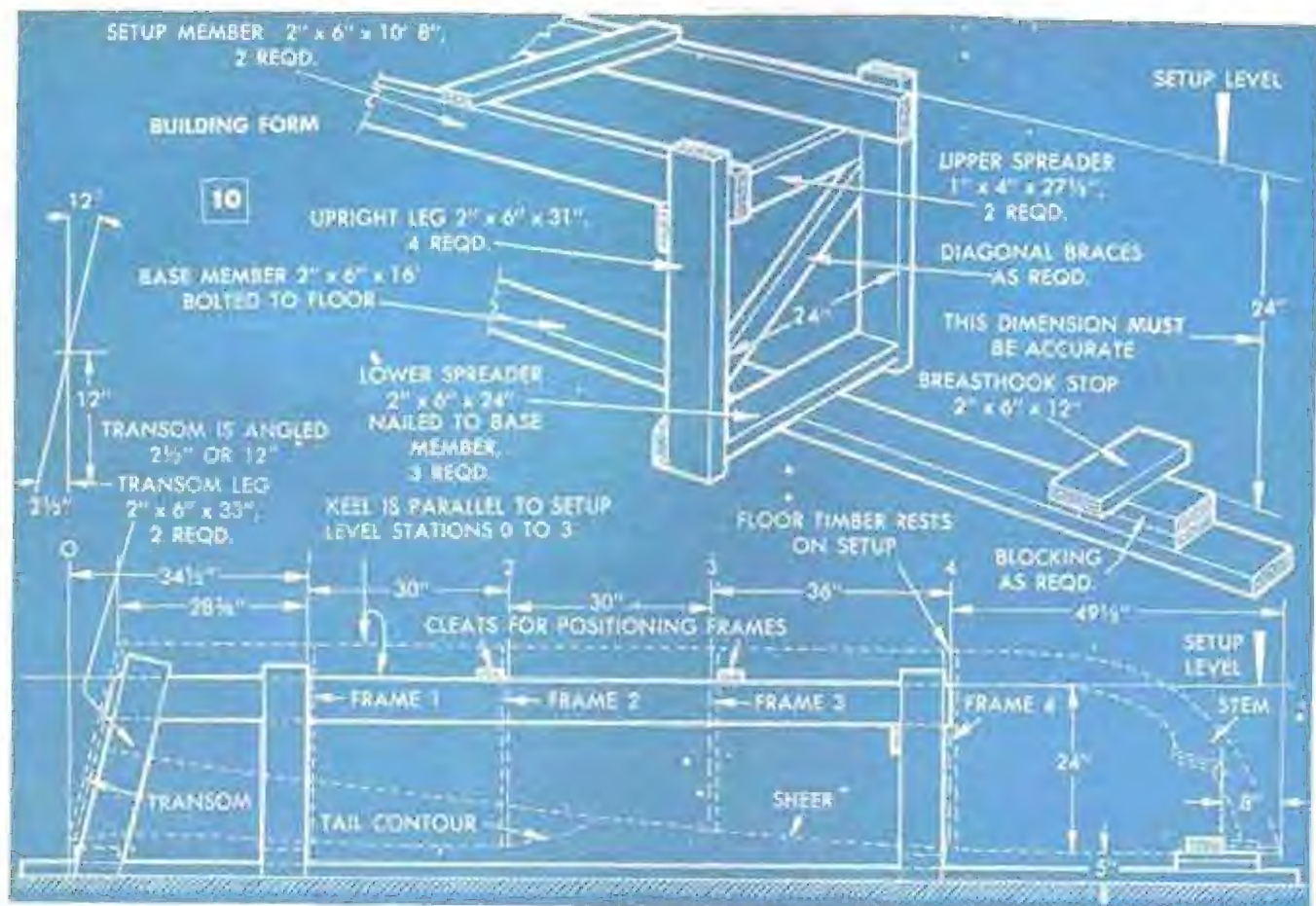
teed exterior plywood. The marine grade or solid-core type plywood is best and is strongly recommended particularly for the planking.

All joints throughout the boat should be glued. Resorcinol-type glue, a liquid and powder combination mixed at the time of use, is recommended. Urea-resin glue can be used, but not when gluing oak that is to be in contact with salt water. Where galvanized bolts are specified, use only the hot-dipped type.

Frames: Half patterns of the four frames are detailed in Figs. 2, 3, 4, 5 and 6. With the exception of the transom, a full-size pattern of each frame should be made on wrapping paper. Note that all width dimensions are taken from a centerline.







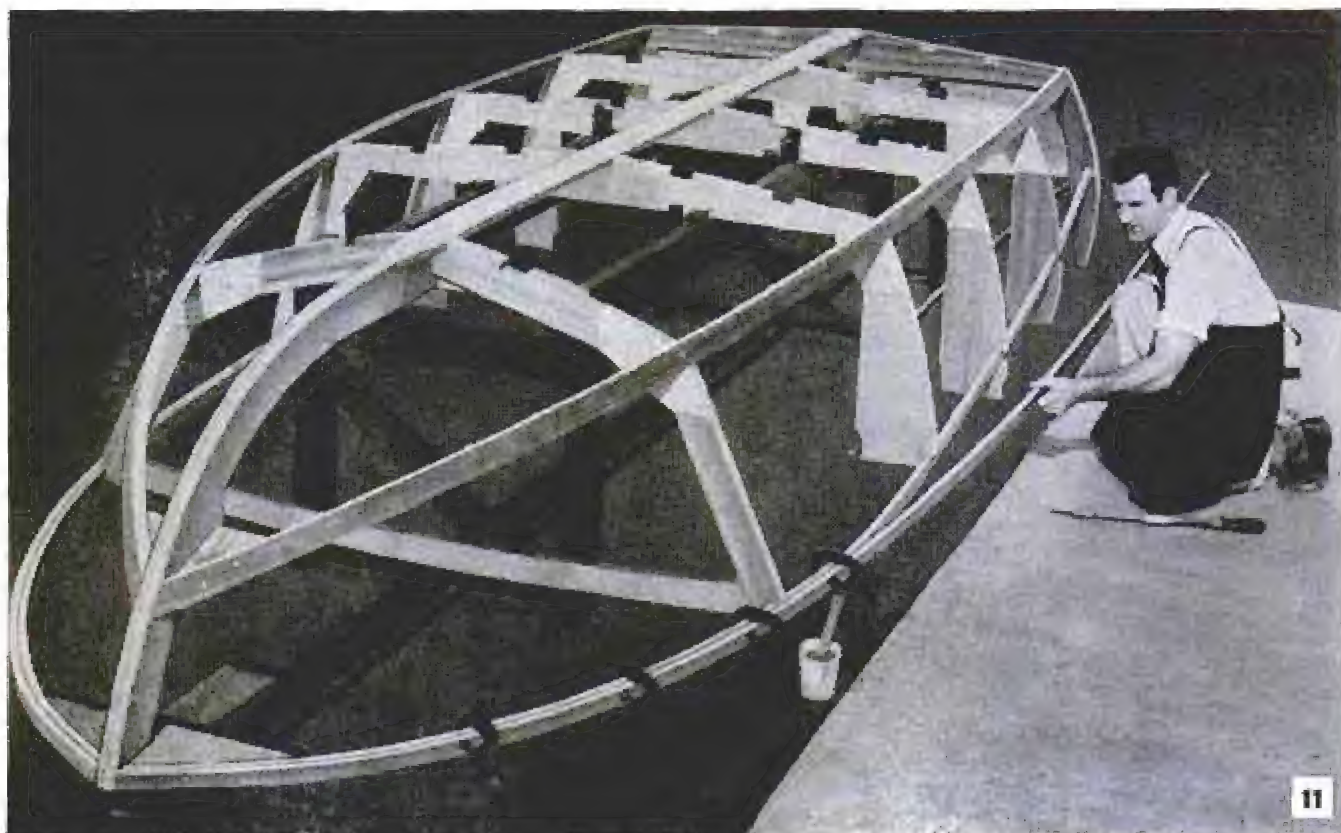
material as the frames, Fig. 1. After assembling all frames, notches for the floor battens, chine log, sheer clamp and keel are cut.

Transom: The transom is laid out full size too, but since the after side of the transom frame is covered with $\frac{3}{4}$ -in. plywood, the pattern is drawn directly on the ply-

wood. Take special note that the transom is at a 12-deg. angle to conform with the keel, sheer, batten and chine notches. The transom and transom frame are assembled with glue and screws (see schedule). The transom is shown with a cutout that will accommodate a single medium-size motor.

(Continued to page 252)

Strongback and attached members must be rigid to prevent movement when sheer clamp is sprung into position



WHAT'S NEW IN BOATING



OUTBOARD HOUSEBOAT is powered by three 60-horsepower motors mounted in wells. One is located forward center and the others are in the stern at the sides. The craft, 60 feet long and 28 feet wide, is claimed to be the world's largest outboard houseboat.

Larry Vita, Smithtown, Long Island, N. Y.

ALUMINUM DUCKBOAT weighs only 69 pounds, allowing one-man portage. The cabin-blind is weather and mildew-proof vinyl-covered nylon which rolls into a small package. Loops are provided for inserting camouflage material. Length of the boat is 11 feet.

Duratech Mfg. Corp., Route 202, East of Peekskill, N. Y.



MOTOR CADDY weighs only five pounds but it will carry outboard motors up to 35 horsepower. The caddy can be slipped into a wall bracket, making it a permanent storage stand.

Marin-E-Products,
3030 Bridgeway,
Sausalito, Calif.



OUTBOARD SPEEDBOAT has skin-stress type of construction with all the hull weight in the skin. Speed is rated at 30 miles per hour with one outboard and 40 plus with two. Inboard models have Corvette, T-Bird, Chrysler or Cadillac engines; speed, 50 plus.

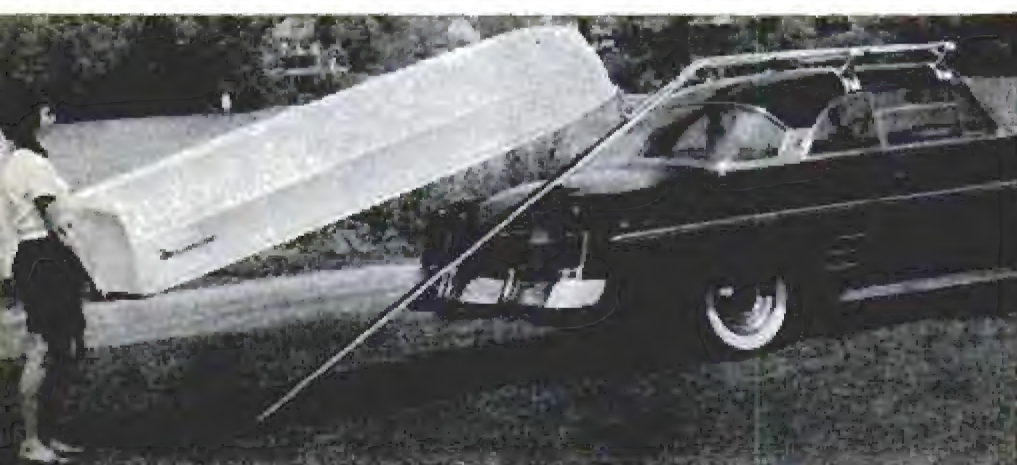
Casey-Craft, Mermentau, La.





SHALLOW WATER for fishing or hunting requires a nearly flat-bottom boat. One of the new models that fills the need also has a deck design that's easy to camouflage for duck hunting. It's lightweight, easy to carry and launch and moves fast with a 10 or 12-horsepower motor. About 12 feet long, it seats two persons

Glass Magic, Inc., 2759 Ludelle St.,
Fort Worth 5, Tex.



EASY BOATLOADING for craft too big for one man to handle but too small for a trailer. A bow wheel assembly is attached to a rubber tire that rolls on a steel ramp. The loading ramp consists of four telescoping channel sections, with the top sections curved at the ends. Roof-top bars can also be used to carry other items

Market Forge Co., Everett 49, Mass.

DAY CRUISER is designed for either single or dual outboard installations. The new models are made with much heavier gauge aluminum in the hull bottoms. Some feature sleeping facilities and an optional hardtop. The aluminum hull is anodized

Feather Craft, Inc., 450 Bishop St., N.W., Atlanta 13, Ga.





BIG OUTBOARD CRUISER has inboard-style comforts and travels at a speed of 18 miles per hour. The 31-foot model sleeps eight and carries a galley with stove, oven and gas refrigerator. Control cables for the two 60-horsepower outboards are completely concealed.

LePage Craft, Maple Grove, Que., Can.

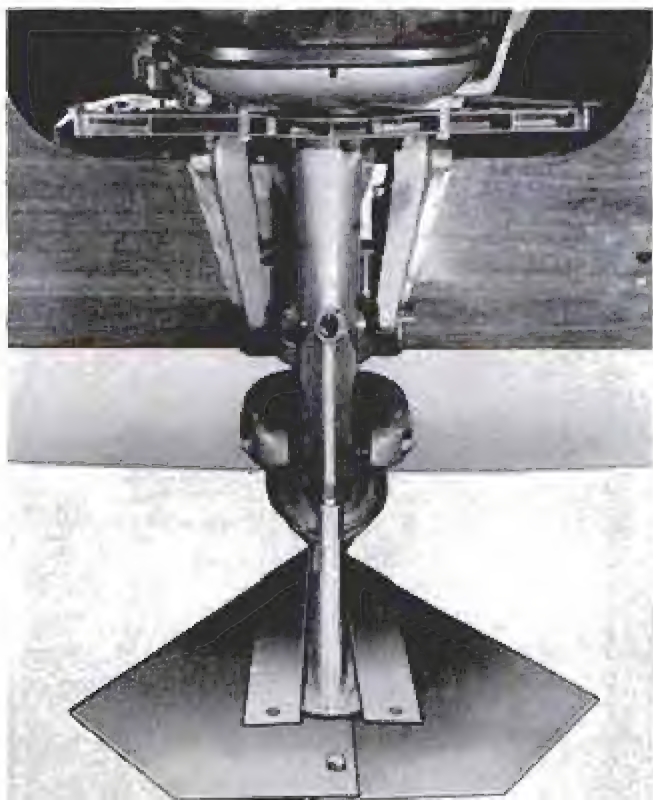


SMALL OUTBOARD is equipped with a 3.6-horsepower motor but can use up to a 10. It cruises at speeds between 5 and 10 miles per hour. Built of mahogany plywood, the craft weighs 100 pounds, has only one seat.

Turn-A-Craft,
Marble Lake, Quincy, Mich.

MOTOR STABILIZER increases power and speed for outboards with 25 or more horsepower. For ski towing, it cuts drift on turns and reduces spray.

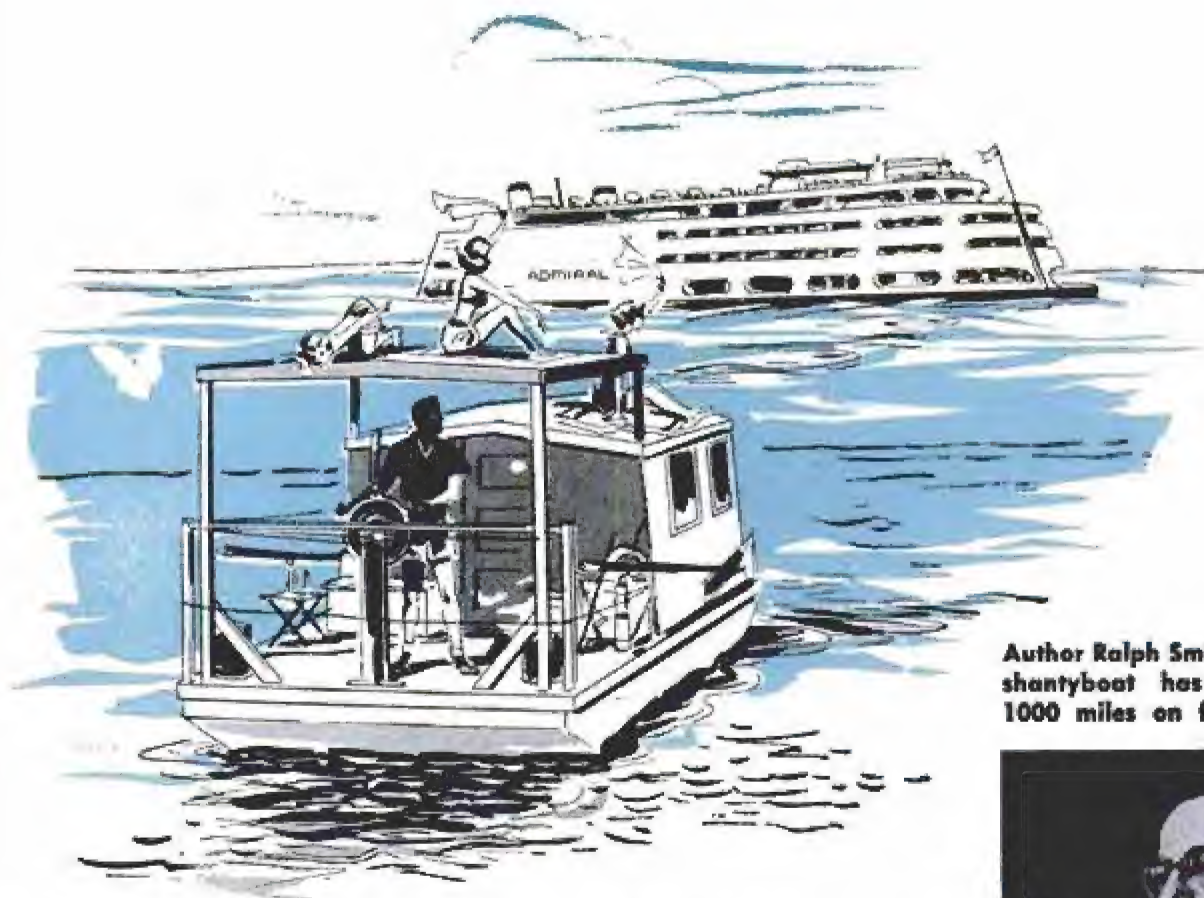
Jagiel Research & Development Co., Toledo, Ohio.



PORTABLE GENERATOR produces 800 watts of 115-volt alternating current. Tank holds fuel for up to three hours of operation. Muffler diverts sound.

Bendix Pacific Div., 11600 Sherman Way,
North Hollywood, Calif.





Author Ralph Smith, whose shantyboat has traveled 1000 miles on five rivers



We're a boating family. We travel by whim, throw away the clock and calendar, always head for one destination—Fun. Our houseboat is homemade, we need no horsepower for

Cruising Down the River

By Ralph Smith



OTHERS CAN HAVE their sleek cruisers and slippery runabouts. For fun on inland water, give me cruising in a shantyboat.

A shantyboat is a houseboat built to travel. Most of the time, in a shantyboat, you just drift on the current and enjoy life. Shoal of draft, easy to handle and sturdy, the shantyboat can—as our experience demonstrates—go just about anywhere on inland waters. We have logged a thousand miles on five rivers over a three-season period in our boat. On the Missouri, with only sweeps for control, we negotiated tricky currents in a river beset with pile dikes and revetments waiting to penalize error by engulfing a boat. The Gasconade,

a brawling, snaggle-toothed mountain stream in the Ozarks, was a harsh test; we found water so shallow that we had to go over the side and lift the boat across gravel bars, as well as rapids so fast that we had to drop the boat through on lines. On the Mississippi and Ohio we successfully rode towboat wakes that put solid water over the deck. On Kentucky Lake, after negotiating the Tennessee, we took open water subject to storms so severe and abrupt that safety harbors are spotted every three miles or so as refuges for the towboats, husky as they are.

Shantyboats are easy to construct, economical to build and can be made large or small, elaborate or simple according to the owner's need or whim. Since the scow hull is little more than a glorified box, any amateur can build one. Simplicity brings economy by permitting the use of dimension lumber without waste. The roominess of the square shape permits a surprising amount of livability to be built into even a small boat.

The attributes—as well as the inevitable disadvantages—of shantyboats are attested by my own craft.

Plywood Hull and Deck

Because I planned to drift, using the current for propulsion and the oars for control, I made the boat as small and maneuverable as possible. Length is 18 feet. Beam is just under eight feet to permit it to be legally towed on a trailer. For lightness, $\frac{3}{4}$ -inch lumber and half-inch plywood were used to sheath the hull. Hull framing con-

sists of two by two-inch lumber for the vertical pieces and two by three-inch material for the cross timbers. To hold down weight, $\frac{3}{8}$ -inch plywood is used for the deck and $\frac{1}{8}$ -inch hardboard for the cabin sides. The result is a 1200-pound craft that pulls no harder than a heavily loaded skiff. We traveled under oars for 700 miles before hanging a motor on the stern at St. Louis, Mo. The motor is only $7\frac{1}{2}$ horsepower, yet so easily does the boat move that it pushed the craft upstream against the current of the Ohio and Tennessee.

Despite the small size, the boat has room equivalent to a conventional boat twice the size. It has full-size bunks for four with air mattresses and sleeping bags, a galley equal in size to the kitchen of an efficiency apartment, a table to accommodate four at meal time, a full-length clothes locker plus bins, drawers and cabinets that carry supplies for three weeks. With six windows, the cabin is so airy that even in the South we found blankets necessary.

Initial Cost: \$400

The cost was surprisingly low. The total initial investment was around \$400. The boat went together in only six months of evening and week-end work. Every piece of wood, save for the curved roof beams, was cut on a bench saw. The precaution of backing all seams with battens and using wicking and compound in all joints and seams paid off; my only concern with the bilge is the cobwebs that form there.

This is not to say that a shantyboat is the perfect boat. There is no such thing. With

Always ready to interrupt our journey, every clear-water creek was a signal for a swim. We carried sheets of hardboard which fit over the canopy to shade deck on warm days





Each evening we headed for a river sandbar. There, as the sun went down behind the distant cottonwoods, we would eat our evening meal around a driftwood fire

a shallow bite on the water—our craft draws but three inches—and the high sides sticking like sails into the air, it is so sensitive to wind that the slightest breeze will send the boat lumbering off. When equipped with sweeps alone, shantyboats are one-way craft. Distance put behind is as impossible to recapture as time. While the scow hull has great initial stability, it lacks a conventional hull's ability to recover if rolled too far. But for places where the water shoals out, for downstream drifting and in protected waters, a shantyboat has advantages not possessed by other craft.

Start at St. Louis

Our pattern of journeying, which we plan to continue until we run out of river, is to drift for three weeks each summer. When we have used up our time we leave the boat on the bank until the following year brings another installment. Two years of journeying took us from Omaha, Neb., to St. Louis, where our 1957 voyage began. On hand were my wife Dorothy, my 11-year-old son John, and my 17-year-old daughter Anne.

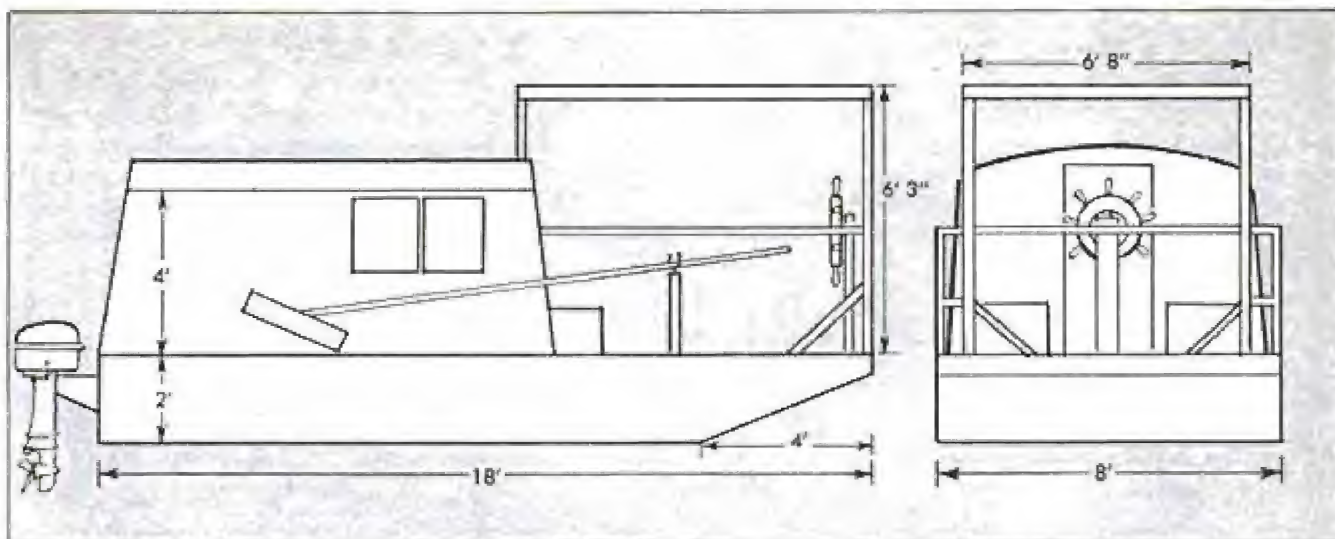
Although we had a gleaming new motor on the stern bracket for the ascent of the Ohio and Tennessee, we put out from St. Louis under oars. Our preference is to drift. It was a novel experience to be rowing a "motorboat" downstream.

We shoved off in the grayness of first light to negotiate St. Louis harbor before the workboats began their busy shuttling of barges back and forth. In the 21 miles

from the Chain of Rocks, where we had been tied, to Jefferson Barracks, the Mississippi has a substantial drop. The resulting stiff current carried us along at high speed—at least for our craft. Breakfast time found us abreast of the old steamboat landing, paved with cobblestones, in downtown St. Louis. We pulled in to eat, making fast to the same shackle that in the days of the packets may have held the *Robert E. Lee* or the *Natchez*, the *Grand Republic* or the *J. M. White*. At noon we passed under the Jefferson Barracks highway bridge at St. Louis' southern environs and shortly thereafter found the bank flanked by the cottonwoods and willows that mark open country. After a year of urban living, we always welcome the bottomland jungle that walls off a too familiar contact with other folks.

Wind Helps—Sometimes

The weather, which during our fitting out had been so hot that even St. Louisans complained, gave us a break. Ordinarily on the river, wind accompanies the sun. On our first day we traveled in utter calm, which made for lazy and delightful drifting. With no breeze to blow it into shore, the boat picked its own way downstream with only an occasional wide-spaced stroke or two of the oars to keep it from sliding out of the current. The only time the man on duty had to get out of his deck chair was to pull the boat out of the way of an approaching towboat. When the wind did blow, as it did on the second day, it was a



Our shantyboat is only 18 feet long. Beam is just under eight feet to permit it to be towed on a trailer

tailwind. We bowled along under its urging to rack up 49 miles—our best distance in a single day in three years of drifting!

We throw away both the clock and the calendar when we drift. Our interest is not mileage but fun; we are always ready to interrupt our journeying. Each clear-water creek was the signal to go overboard for a swim. At Ste. Genevieve, a town so old that it looks on St. Louis—itsself among the oldest of major American cities—as a Johnny-come-lately, we spent a day studying the old buildings. When we were caught upstream from the mouth of the Okaw River by a windstorm so severe that it lifted the sand off the bars into a river dust storm, we let the boat scud into shore and spent the rest of the day fitting to the canopy the sheets of hardboard I had tem-

porarily lashed in place at St. Louis. At Chester, Ill., we laid over for half a day waiting for my daughter Mary, and her college roommate, Lorraine Livingston, who were to make the balance of the trip with us.

Acres of Barges

The motor proved itself an instrument of both safety and comfort below Chester. When the weather reverted to its usual pattern, we would drift in the morning calm until the rising breeze made it difficult to hold the boat in the river. Then we would go under power until late afternoon brought a lessening of the wind. On occasion we used the motor to get out of the path of towboats, which constitute the

(Continued to page 234)

Despite its small size, our boat has room equivalent to conventional boats twice as big. It has full-size bunks for four, a galley equal to the kitchen of an efficiency apartment, plus storage space for three weeks' supplies



TRAFFIC QUIZ FOR BOATERS

How good a pilot are you? Here's a traffic quiz on rules of the road for boaters. The traffic laws for boats take several forms, depending upon the waters involved; there are International Rules of the Road, Inland Rules of the Road, Pilot Rules and state laws. In most basic respects the laws are similar, though

the pleasure-boat skipper should be thoroughly familiar with the rules governing his own waters. Those rules are based on marine custom and common sense. Try the quiz below. Most rules of the road, whatever the waters, agree on the correct answers. You'll find those answers on page 230



1. You are skipper of the powerboat at left, in a hurry to meet some friends for a picnic lunch. Already you are late, and you're afraid you'll miss the fried chicken. You want to pass the fishing vessel. Is this permitted? And what about that sailboat on your starboard bow? What should you do in this situation?



2. You're out for a trial run in your new runabout, shown at right. Suddenly you spot the sailboat off your port bow. Obviously the two boats are on a collision course. Who has the right of way, you or the skipper of the sailboat? And regardless of the right of way, what should you do?



3. You're skipper of the powerboat shown in the foreground, under way and headed out toward open water. Just casting off from the slip on your port bow is a sailboat. Is there any reason why you shouldn't continue on your present course? In this case, who has the right of way?



4. You are heading up a river channel, overtaking another boat. Ordinarily, according to custom, you would pass to port. However, in this case the dock is an obstacle to port, so you decide to pass to starboard. Is there any reason why you shouldn't? What should you do before you pass?

5. You are skipper of the small boat shown below. You are out for a pleasure cruise, dawdling along the canal and admiring the scenery. Astern, and overtaking you, appears a towboat pulling a string of barges. Do you have the right of way, or the towboat? What should you do?



DO MOTORBOATS SCARE FISH?

By Dr. Karl F. Lagler

CHAIRMAN, DEPARTMENT OF FISHERIES,
SCHOOL OF NATURAL RESOURCES, UNIVERSITY OF MICHIGAN

DID YOU EVER go fishing on a fine, fine day and then wonder whether motorboats were scaring all the fish away?

Both as an enthusiastic angler and an aquatic scientist, I've done my share of worrying over this problem. Then, several years back, I started doing research to find out whether motorboats affect fishing. My research, some of it scientific, some personal, has convinced me that:

- Motorboats seldom harm fish — large, small or even eggs.

- Motorboats seldom, if ever, keep fish from spawning.

- Motor noise does not appear to disturb fish.

- And—most important to the fisherman—the noise of nearby motors has not been shown to affect the rate at which fish bite!

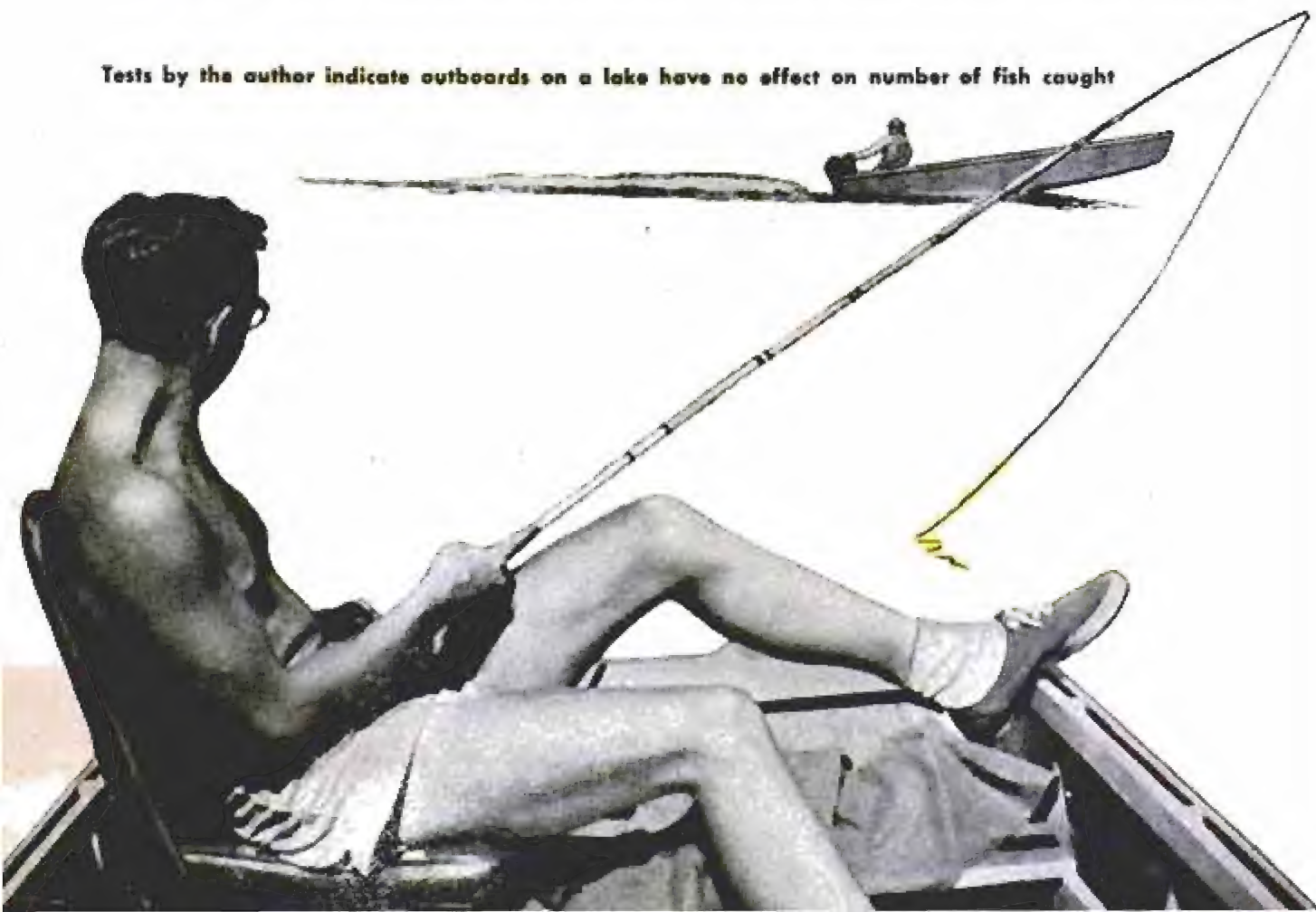
It takes a lot of convincing for me to be convinced. Perhaps you are the same. But convinced I am, as the result of scientific and personal research stretching over 10 years.

The first thing that bothered me about motorboats was the way they rocked my boat or drowned my fly as they passed when I was fishing. I had no way of knowing whether they had anything to do with the number of fish I hooked. This set me to thinking about the ways that motorboats might be harmful to fish and to fishing. Now I've done enough research to answer some of the questions.

Do Motorboats Injure Fish?

The answer to this one is: rarely. The ability of fish to avoid collision with objects

Tests by the author indicate outboards on a lake have no effect on number of fish caught





Mullet, photographed at Silver Springs, Fla., show little concern about outboard motor operating nearby

is truly remarkable. Have you ever seen two fish collide? They are protected from such mishaps by all the senses we have, plus special low-frequency-sound detectors.

Stand on a bridge or causeway in the Florida Keys, visit Marineland in Florida and watch the behavior of fish in large schools. Here great numbers of fish wheel and turn, bank and dive, and never collide.

Now come with me on a week end to my summer home on a chain of lakes 50 miles from the heart of Detroit. Here the fish are

numerous, both in kinds and numbers. The afternoons hum with speeding motorboats. In connecting channels there's often quite a traffic jam. But in all my years at these lakes I have never seen the shores littered with dead fish following a boating-filled week end, nor has anyone else reported such slaughter by boats. In fact, worm fishermen may be responsible for more deaths of fish than power-boaters. That few fish survive being hooked on live bait and then released has been proved by scientists.

Samples taken from bottoms of test ponds show that fish food organisms thrive despite use of motors

Dissolved gases in water, here being tested by author, aren't rendered lethal by intensive motor use





Robot outboard circling pond two or more hours a day didn't interfere with spawning of bass and bluegills

Occasionally, over the years, people have brought or sent me fish apparently killed by wounds. I have not always been able to identify the cause of death. However, among the culprits (in addition to hooks)

Other tests showed water did not become noticeably more cloudy than in adjacent nonmotor-use ponds

have been bears, mink, otter, herons and kingfishers. All of these make fairly characteristic marks on their prey. As I recall, I have seen only two fish, one a walleye, the other a sucker, that quite certainly had been killed by a propeller slash.

What about young fish? Can they be destroyed by props of motorboats? Certainly they can—if they are really in the way. Occasionally the eggs of sunfish, crappies, bass, perch and walleyes are in motorboat waters, yet most will be in areas too shallow to be bothered. However, eggs in direct line of propeller blasts may be dislodged and scattered, and will be ready prey for natural enemies. In actual tests, guardian-parent bass and other members of the sunfish family returned promptly to their nests when chased away by an oar or by a propeller passing very close to them. Even slow-swimming young fish, such as largemouth bass, can keep out of the way of motorboats (at least up to boat speeds of 12 miles per hour).

With my colleague, Dr. Albert S. Hazard, now research director of the Pennsylvania Fish Commission, I once stocked two similar, adjacent ponds in Michigan with the same number of fingerling largemouth bass. In one pond every morning and afternoon, a five-horsepower outboard ran out a tank full of fuel at three-quarter speed (about 12 miles per hour). The robot boat circled the pond again and again on a bridle attached to a swivel on a tall stake in the center of the pond. It ran the circular course for about an hour, morning and afternoon, all summer long. At the end of the summer, the ponds were drained and



the fish recovered and counted. The motors had not killed off the fish at all! In fact, perhaps accidentally, there was slightly better survival in the motor-use pond than in the other.

In the experimental motor-use pond the exhaust gas (carbon monoxide) did not accumulate to an amount that killed fish. The motors did not cause measurable damage to fish-food organisms. The water did not become noticeably more cloudy (turbid) than in the adjacent nonmotor-use one. And oil from repeated spillage when filling engines never became evident around the shores.

Do Motorboats Prevent Spawning?

Hardly—for several reasons. First, most food and game species spawn either in the early spring or late fall outside the peak seasons of powerboating. Before the end of June, most black bass have already spawned throughout their range from the Gulf of Mexico to Canada. The same is true for walleye, perch and pike. Brook trout and brown trout are fall spawners.

In addition, most fish apparently have no more fear of motorboats than you and I, as pedestrians, have of the average automobile. Rock bass and several kinds of sunfishes are all known to nest successfully

adjacent to heavily used boating channels. Lie on a dock and watch the fish while a motorboat roars by—they hardly bat the eyelashes they don't have.

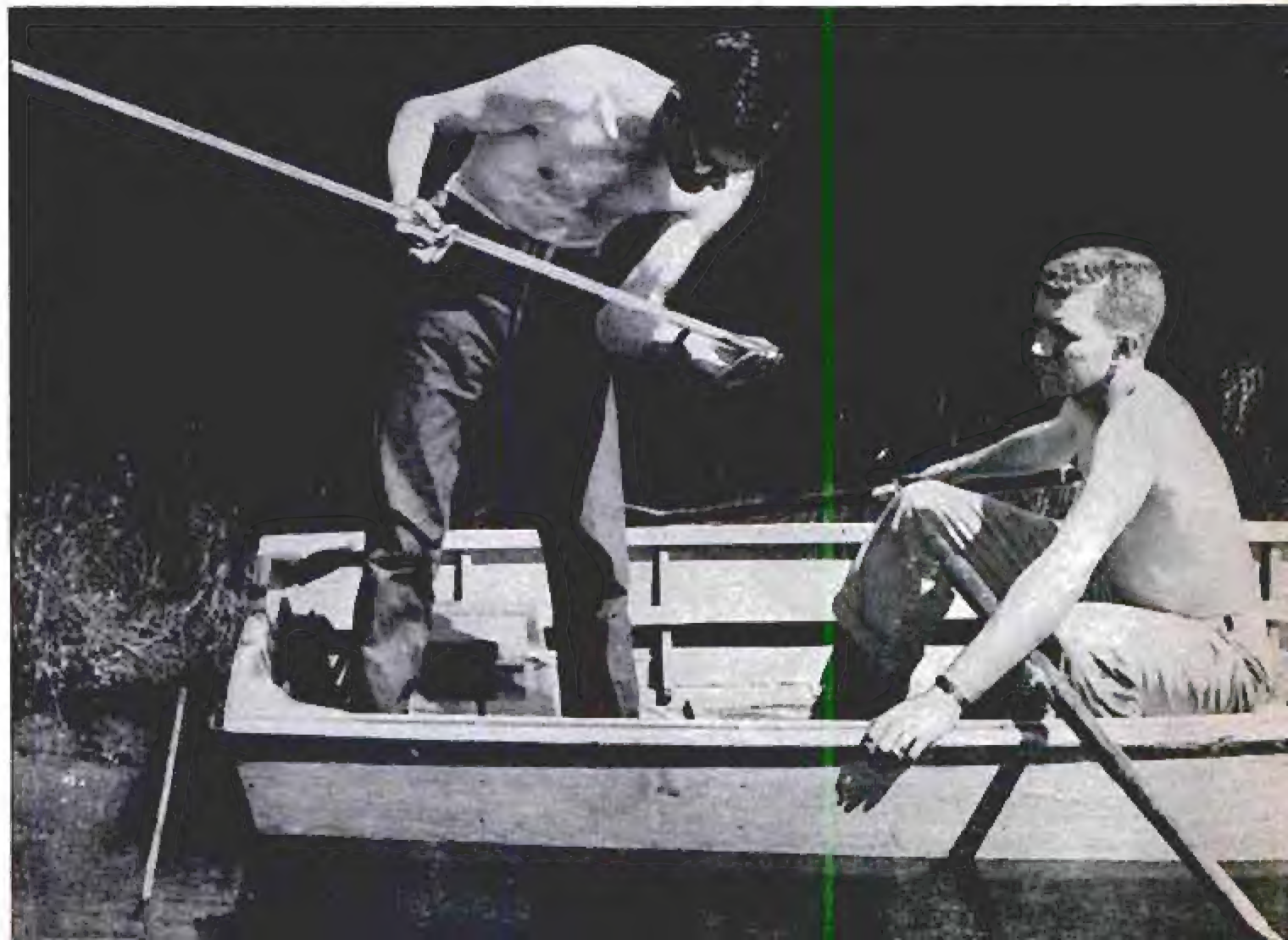
In order to see if bluegills and largemouth bass would be kept from spawning by powerboats, we performed another experiment. Four similar ponds were chosen at Michigan's Wolf Lake Fish Hatchery. One pair of ponds was stocked with bluegill, the same number to each pond. The other two ponds were stocked with identical numbers of largemouth breeders. Motors were run daily for two hours on circling robot boats in one of each pair of ponds. Judging from the numbers of young fish taken from the ponds at the end of the experiment, nesting was equally successful in the motor-use as in the nonmotor-use ponds. Later, at the end of the summer, similar numbers of fish were taken from the ponds. This showed that not only would nests be built near motorboat courses but also that the young in nests would hatch successfully and survive through a whole summer of boat activity.

Does Engine Noise Disturb Fish?

Not much, if at all. Come along to a smallmouth-bass river or a trout stream.

(Continued to page 244)

Young fish survive well in motor-use waters as seen after drawing samples from nests into glass tubes



BUYERS' GUIDE TO

Brand Name and Source, Manufacturer if Other Than Source	Model Name or Number	Horsepower (at r.p.m. rated)	Weight (pounds)	Number of Cylinders	Displacement (inches)	Bore and Stroke (inches)	Gearshift	Fuel Tank Capacity (gallons if unstated)	Starter	Price
AIRBOY (Air-drive) Airboats, Inc. St. Louis, Mo.	Model 20	2	38	1	4.7	2 1/4 x 1 1/2	None, pivot	1.5 Quarts	Manual	\$179.50
	Model 40	4	54	1	8	2 1/4 x 2	None, pivot	2 Quarts	Manual	215.00
BUCCANEER Gale Products Galesburg, Ill.	3015B	3 at 4000	37	1	5.37	2 1/8 x 1 1/2	None, pivot	5	Manual	140.00
	5513B	5 at 4000	46.5	2	8.84	1 15/16 x 1 1/2	None, pivot	8	Manual	185.00
	5015B	5 at 4000	51	2	8.84	1 15/16 x 1 1/2	Yes	4.25	Manual	230.00
	12513B	12 at 4000	69.5	2	17.89	2 1/4 x 2 1/4	Yes	2	Manual	325.00
	12017B	12 at 4000	77.5	2	17.89	2 1/4 x 2 1/4	Yes	6	Manual	350.00
	22015B	25 at 4000	119.5	2	35.7	2 7/8 x 2 3/4	Yes	6	Manual	465.00
	220E15B	25 at 4000	130	2	35.7	2 7/8 x 2 3/4	Yes	6	Electric	555.00
	350E10B	35 at 4500	134	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	585.00
CHAMPION Champion Motors Co. Minneapolis, Minn.	Guide Four	4.2 at 4300	42	1	5.84	2 1/16 x 1 3/4	No	10 Pints	Manual	179.00
	Guide Six	6 at 4300	46	2	9.66	1 7/8 x 1 1/4	Yes	10 Pints	Manual	233.00
	Superior 7	7.8 at 4300	46	2	9.66	1 7/8 x 1 3/4	Yes	28 Pints	Manual	265.00
	Sweet 16	16.5 at 4300	58	2	19.94	2 1/2 x 2 1/32	Yes	6	Manual	387.00
	Sweet 16	16.5 at 4300	58	2	19.94	2 1/2 x 2 1/32	Yes	6	Manual	376.00
	Hot Rod	Class B	46	2	19.94	2 1/2 x 2 1/32	No	2	Manual	475.00
	Tandem 33	16.5 at 4300	58	2	19.94	2 1/2 x 2 1/32	Yes	6	Manual	631.00
										x per
CONTINENTAL Continental Mfg. Co. Culver City, Calif.	Sport	2.5 at 3750	22	1	5.05	1 5/8 x 1 5/8	None, pivot	5 Pints	Manual	89.95
	Sport Deluxe	2.5 at 3750	27	1	5.05	1 5/8 x 1 5/8	None, pivot	5 Pints	Manual	99.95
DRAGONFLY (Air-drive) Robertson-Hedges, Inc. Kansas City, Mo.	41	2 at 4000	41	1	4.7	2 1/4 x 1 1/2	None	25	Manual	189.50
	81	5 at 4000	50	1	8.1	2 1/2 x 1 5/8	None	30	Manual	279.50
ELGIN Sears, Roebuck and Co. Chicago, Ill. (West Bend)	5823	2 at 4000	28	1	3.16	1 3/4 x 1 1/16	None, pivot	31	Manual	99.95
	5953	5.5 at 4000	56	2	10.6	2 x 1 11/16	Yes	4.25	Manual	209.95
	5973	7.5 at 4000	56	2	11.97	2 1/8 x 1 11/16	Yes	4.25	Manual	229.95
	5878	7.5 at 4000	50	2	11.97	2 1/8 x 1 11/16	None, pivot	5	Manual	199.95
	5896	12 at 4000	61	2	17.72	2 3/8 x 2	Yes	6	Manual	279.95
	5897	12 at 4000	61	2	17.72	2 3/8 x 2	Yes	6	Manual	289.95
	5893	12 at 4000	64	2	17.72	2 3/8 x 2	Yes	4.25	Manual	269.95
	5944	35 at 4500	118	2	41.49	3 1/8 x 2 7/16	Yes	6	Manual	449.95
	5945	35 at 4500	121	2	41.49	3 1/8 x 2 7/16	Yes	6	Manual	459.95
	5987	35 at 4500	130	2	41.49	3 1/8 x 2 7/16	Yes	6	Electric	519.95
	5983	35 at 4500	133	2	41.49	3 1/8 x 2 7/16	Yes	6	Electric	529.95
EVINRUDE Evinrude Motors Milwaukee, Wis.	Lightwin	3 at 4000	33	2	5.28	1 9/16 x 1 3/8	None, pivot	7	Manual	160.00
	Ducktwin	3 at 4000	33	2	5.28	1 9/16 x 1 3/8	None, pivot	7	Manual	160.00
	Fisherman	5.5 at 4000	56	2	8.84	1 15/16 x 1 1/2	Yes	4.25	Manual	230.00
	Fleetwin	7.5 at 4000	59	2	12.4	2 1/8 x 1 3/4	Yes	4.25	Manual	270.00
	Sportwin	10 at 4000	68	2	16.6	2 3/8 x 1 7/8	Yes	6	Manual	310.00
	Eastwin	18 at 4500	80	2	22	2 1/2 x 2 1/4	Yes	6	Manual	395.00
	Eastwin	18 at 4500	87	2	22	2 1/2 x 2 1/4	Yes	6	Electric	475.00
	Big Twin	35 at 4500	123	2	40.5	3 1/16 x 2 3/4	Yes	6	Manual	495.00
	Big Twin	35 at 4500	129	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	585.00
	Lark	35 at 4500	138	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	625.00
	Four Fifty	50 at 4000	197	V 4	70.7	3 x 2 1/2	Yes	6	Manual	740.00
FAGEOL Fageol Products Co. Kent, Ohio	44	40 at 5200	190	4	44	2 1/2 x 2 1/4	Yes	6.5	Electric	
	60	50 at 5200	190	4	60	2 3/4 x 2 1/2	Yes	6.5	Electric	
	Gold Cup 60	55 at 5200	190	4	60	2 3/4 x 2 1/2	Yes	6.5	Electric	
FIRESTONE Firestone Outboard Motors Minneapolis, Minn. (Scott-Airwater)	3.6	3.6 at 4000	36	1	6.21	2 1/8 x 1 3/4	No	1	Manual	125.00
	5	5 at 4200	42	2	7.48	1 11/16 x 1 43/64	Yes	3.5	Manual	225.00
	10	10 at 4200	59	2	14.87	2 11/64 x 2	Yes	6	Manual	320.00
	16	16 at 4200	88	2	19.95	2 11/32 x 2 5/16	Yes	6	Manual	365.00
	38	38 at 4800	117	2	40.51	3 1/16 x 2 3/4	Yes	6	Electric	Optional
HAUWATHA Gamble-Skogmo, Inc. Minneapolis, Minn. (Scott-Airwater)	3.6	3.6 at 4000	36	1	6.21	2 1/8 x 1 3/4	None, pivot	1	Manual	109.95
	5	5 at 4200	45	2	7.48	1 11/16 x 1 43/64	Yes	3.5	Manual	209.95
	7.5	7.5 at 4200	59	2	11	2 x 1 3/4	Yes	6	Manual	264.95
	10	10 at 4200	66	2	14.87	2 11/64 x 2	Yes	6	Manual	319.50
	16	16 at 4200	79	2	19.95	2 11/32 x 2 5/16	Yes	6	Manual	349.95
	38	38 at 4800	128	2	40.51	3 1/16 x 2 3/4	Yes	6	Electric	Optional
	Super Sea Horse	35 at 4500	138	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	625.00
JOHNSON Johnson Motors Waukegan, Ill.	Sea Horse 3	3 at 4000	31.25	2	5.28	1 9/16 x 1 3/8	None, pivot	4.88 Pints	Manual	160.00
	Sea Horse 5.5	5.5 at 4000	56	2	8.84	1 15/16 x 1 1/2	Yes	4.5	Manual	230.00
	Sea Horse 7.5	7.5 at 4000	59	2	12.4	2 1/8 x 1 3/4	Yes	4.5	Manual	270.00
	Sea Horse 10	10 at 4000	67	2	16.6	2 3/8 x 1 7/8	Yes	6	Manual	310.00
	Sea Horse 18	18 at 4500	71	2	22	2 1/2 x 2 1/4	Yes	6	Manual	395.00
	Sea Horse 18	18 at 4500	87	2	22	2 1/2 x 2 1/4	Yes	6	Electric	475.00
	Sea Horse 35	35 at 4500	123	2	40.5	3 1/16 x 2 3/4	Yes	6	Manual	495.00
	Sea Horse 35	35 at 4500	129	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	585.00
	Super Sea Horse 35	35 at 4500	138	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	625.00
	Sea Horse 50	50 at 4000	197	V 4	70.7	3 x 2 1/2	Yes	6	Manual	740.00
	Super Sea Horse 50	50 at 4000	205	V 4	70.7	3 x 2 1/2	Yes	6	Electric	840.00
MAJESTIC Outboard Motor Brands, Inc. Minneapolis, Minn. (Champion)	Fisherman	4.2 at 4300	42	1	5.84	2 1/16 x 1 3/4	No	10 Pints	Manual	179.00
	M 3N GS	6 at 4300	46	2	9.66	1 7/8 x 1 3/4	Yes	10 Pints	Manual	233.00
	M 4N GS	7.8 at 4300	47	2	9.66	1 7/8 x 1 3/4	Yes	10 Pints	Manual	249.00
	M 6N GS	15 at 4300	54	2	19.94	2 1/2 x 2 1/32	Yes	6	Manual	355.00

* Data not available

→ Arrow indicates new, significant or special motors this year

THE '58 OUTBOARDS

Brand Name and Source, Manufacturer if Other Than Source	Model Name or Number	Horsepower (at r.p.m. rated)	Weight (pounds)	Number of Cylinders	Displacement (inches)	Bore and Stroke (inches)	Gearshift	Fuel Tank Capacity (gallons if unstated)	Starter	Price
MERCURY Kiekhaefer Corp. Fond du Lac, Wis.	Mark 6	6	42	2	7.2	1 3/4 x 1 1/2	None, pivot	6	Manual	\$225.00
	Mark 10	10	56	2	18.5	2 1/2 x 2 1/8	Yes	6	Manual	330.00
	Mark 25	20	75	2	20	2 7/16 x 2 1/8	Yes	6	Manual	380.00
	Mark 28	27	75	2	22	2 9/16 x 2 1/8	Yes	6	Manual	430.00
	Mark 30	30	110	4	30	2 7/16 x 2 1/8	Yes	6	Manual	479.50
	Mark 55	40	111	4	40	2 7/16 x 2 1/8	Yes	6	Electric Optional	535.00
	Mark 58	45	127	4	44	2 9/16 x 2 1/8	Yes	6	Electric Optional	630.00
	Mark 75	60	163	6	60	2 7/16 x 2 1/8	Reversing powerhead	6	Electric Optional	730.00
	Mark 78	70	180	6	66	2 9/16 x 2 1/8	Reversing powerhead	6	Electric	960.00
NEPTUNE Muncie Gear Works Muncie, Ind.	Slightly Mide	17 at 4000	17	6	3.0	1 9/16 x 1 1/2	None	25	Manual	89.50
OLIVER Oliver Outboard Motors Battle Creek, Mich.	6	6 at 4500	50	2	9.42	2 x 1-1/2	Yes	3.5	Manual	235.00
	16	16 at 4500	79	2	19.94	2 1/2 x 2 1/32	Yes	6	Electric Optional	380.00
	55 Olympus	35 at 4500	125	2	42.35	3 1/16 x 2 7/8	Yes	6	Electric	640.00
SCOTT-ATWATER Scott-Atwater Mfg. Co. Minneapolis, Minn.	3-6	3-6 at 4000	36	1	6.23	2 1/8 x 1 3/4	None	8 pints	Manual	134.00
	5	5 at 4200	50	2	7.48	1 11/16 x 1 43/64	Yes	3.5	Manual	242.75
	7-5	7-5 at 4200	60	2	11	2 x 1 3/4	Yes	6	Manual	277.25
	10	10 at 4200	65	2	14.82	2 1/16 x 2	Yes	6	Manual	324.50
	16	16 at 4200	80	2	19.95	2 11/32 x 2 5/16	Yes	6	Manual	384.25
	Manual Start 27	27 at 4800	107	2	27.65	2 11/16 x 2 7/16	Yes	6	Manual	448.50
	Electric Start 27	27 at 4800	119	2	27.65	2 11/16 x 2 7/16	Yes	6	Electric with generator	563.50
	Manual Start 40	40 at 4800	130	2	42.18	3 1/8 x 2 3/4	Yes	6	Manual	538.50
	Electric Start 40	40 at 4800	142	2	42.18	3 1/8 x 2 3/4	Yes	6	Electric with generator	663.00
	Royal Scott 40	40 at 4800	142	2	42.18	3 1/8 x 2 3/4	Yes	6	Electric with generator	740.00
	Flying Scott	60 at 4800	160	3	63.77	3 1/8 x 2 3/4	Yes	6	Electric with generator	-
SEA-BEE Goodyear Tire and Rubber Co., Akron, Ohio (Gale Products)	3 HP Deluxe	3 at 4000	32	1	5.37	2 1/8 x 1 1/2	None, pivot	5	Manual	139.95
	5 HP Standard	5 at 4000	58	2	8.84	1 15/16 x 1 1/2	Yes	5	Manual	175.95
	5 HP Deluxe	5 at 4000	70	2	8.84	1 15/16 x 1 1/2	Yes	5	Manual	205.95
	12 HP Standard	12 at 4000	71.5	2	17.89	2 1/4 x 2 1/4	Yes	6	Manual	379.00
	12 HP Deluxe	12 at 4000	77.5	2	17.89	2 1/4 x 2 1/4	Yes	6	Manual	355.00
	25 HP Rewind Standard	25 at 4000	119.5	2	35.7	2 7/8 x 2 3/4	Yes	6	Manual	439.00
	25 HP Rewind Deluxe	25 at 4000	119.5	2	35.7	2 7/8 x 2 3/4	Yes	6	Manual	470.00
	25 HP EL Standard	25 at 4000	130	2	35.7	2 7/8 x 2 3/4	Yes	6	Electric	529.00
	25 HP EL Deluxe	25 at 4000	130	2	35.7	2 7/8 x 2 3/4	Yes	6	Electric	560.00
	35 HP Deluxe	35 at 4500	144	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	585.00
SEA KING Montgomery Ward and Co., Chicago (Gale Products)	60-9006	3 at 4000	32	1	5.32	2 1/8 x 1 1/2	None, pivot	5	Manual	116.00
	60-9003	5 at 4000	46.5	2	8.84	1 15/16 x 1 1/2	None, pivot	5	Manual	133.88
	60-8940	5 at 4000	52	2	8.84	1 15/16 x 1 1/2	Yes	1	Manual	184.00
	60-9016	12 at 4000	69.5	2	17.89	2 1/4 x 2 1/4	Yes	2	Manual	233.88
	60-8971	12 at 4000	77.5	2	17.89	2 1/4 x 2 1/4	Yes	6	Manual	307.00
	60-9005	12 at 4000	86.5	2	17.89	2 1/4 x 2 1/4	Yes	6	Electric	365.00
	60-9025	25 at 4000	119.5	2	35.7	2 7/8 x 2 3/4	Yes	6	Manual	410.00
	60-9026	25 at 4000	130	2	35.7	2 7/8 x 2 3/4	Yes	6	Electric	479.00
	60-8997	35 at 4500	134	2	40.5	3 1/16 x 2 3/4	Yes	6	Electric	585.00
VOYAGER Outboard Motor Brands, Inc. Minneapolis, Minn. (Champion)	Fisherman Special	4.7 at 4300	42	1	5.84	2 1/16 x 1 3/4	No	10 Pints	Manual	179.00
	V-3N-GS	6 at 4300	46	2	9.66	1 7/8 x 1 3/4	Yes	10 Pints	Manual	233.00
	V-4N-GS	7.8 at 4300	47	2	9.66	1 7/8 x 1 3/4	Yes	10 Pints	Manual	249.00
	V-6N-GS	15 at 4300	54	2	19.94	2 1/2 x 2 1/32	Yes	6	Manual	355.00
WEST BOND West Bend Aluminum Co., Hartford, Wis.	Shrimp Pike	2 at 4000	28	1	3.76	1-3/4 x 1 9/16	None, pivot	5 Pints	Manual	119.95
	Pike	6 at 4500	56	2	10.60	2 x 1 11/16	Yes	4.5	Manual	249.95
	Muskie	8 at 4500	57	2	11.97	2 1/8 x 1 11/16	Yes	4.5	Manual	275.00
	Barracuda	12 at 4000	59	2	17.72	2-3/8 x 2	Yes	6	Manual	349.95
	Shark	35 at 4500	118	2	41.49	3 1/8 x 2 7/16	Yes	6	Manual	495.00
	Shark	35 at 4500	132	2	41.49	3 1/8 x 2 7/16	Yes	6	Electric	585.00
	Shark	35 at 4500	136.5	2	41.49	3 1/8 x 2 7/16	Yes	6	Electric with generator	615.00
WIZARD Western Auto Supply Co., Kansas City, Mo. (Oliver)	Powermatic 55	5.5 at 4200	55	2	9.42	2 x 1-1/2	Yes	3.5	Manual	210.00
	Powermatic 15	15 at 4200	75	2	19.94	2 1/2 x 2 1/32	Yes	6	Manual	339.50
	Powermatic 35	35 at 4500	120	2	42.35	3 1/16 x 2 7/8	Yes	6.5	Manual	495.00
	Powermatic 35	35 at 4500	125	2	42.35	3 1/16 x 2 7/8	Yes	6.5	Electric with generator	595.00



SHOPPING FOR A USED OUTBOARD

By V. Lee Oertle *5300 Grand Ave.
Covina, Calif.*

BUYING A USED BOAT can be fun, but to get a good buy, just as thorough an inspection and testing of it is required as is necessary when purchasing a used car. Time spent carefully checking the hull and equipment of the boat of your choice will pay dividends later in carefree

Fig. 1. Make visual inspection of propellers. Nicks, dents or bent blades might cause excessive vibration



boating with a minimum of expense for repairs, regular maintenance and fuel. Never buy a used boat without first running it to see if it handles satisfactorily. If possible, try to test run the boat with about the same passenger load and water-surface conditions prevailing as you'd expect under normal use of it. The boat should be large enough to accommodate comfortably the skipper, his crew (family) and one or two guests but not so large as to strain the recreation budget and demand too much of your free time for maintenance and operation.

Whatever the choice, you will discover that there is no boat that will perform ideally under all conditions. A fast hull on one boat may be unsafe in rough water. A deep keel on another design may handle well in rough water but would require more power and need excessive depth of water in back channels and shoals where fishing is likely to be good. If speed is of primary importance, as when towing skiers or for fast cruising, select a boat of shallow draft, moderate beam and strong construction so that it will take the strain of pounding in choppy water with powerful outboards mounted on the transom.

When buying a boat for cruising, don't

try to get the biggest thing obtainable for the outlay you expect to make. Give more consideration to design, construction and suitability than to mere size, even if it becomes necessary to sacrifice some of the accommodations you would like to have.

There are bad boats as well as good ones on the market. Some of the bad ones may be relatively young in years bedecked with fine coats of paint and varnish. If the boat is in the water, have it hauled out and check the bottom. The planking should abutt the transom and stem squarely and solidly. Sight along the keel for "hooks" (large concave indentations in the bottom caused by improper support of the hull during storage, or damaged longitudinal

Fig. 3, right. If boat is in good condition, bottom will appear to be flat or slightly convex when straightedge is held against hull planking next to the keel

Fig. 4, below. Heavy duty trailer with cradle-type hull support is needed to haul heavy boat

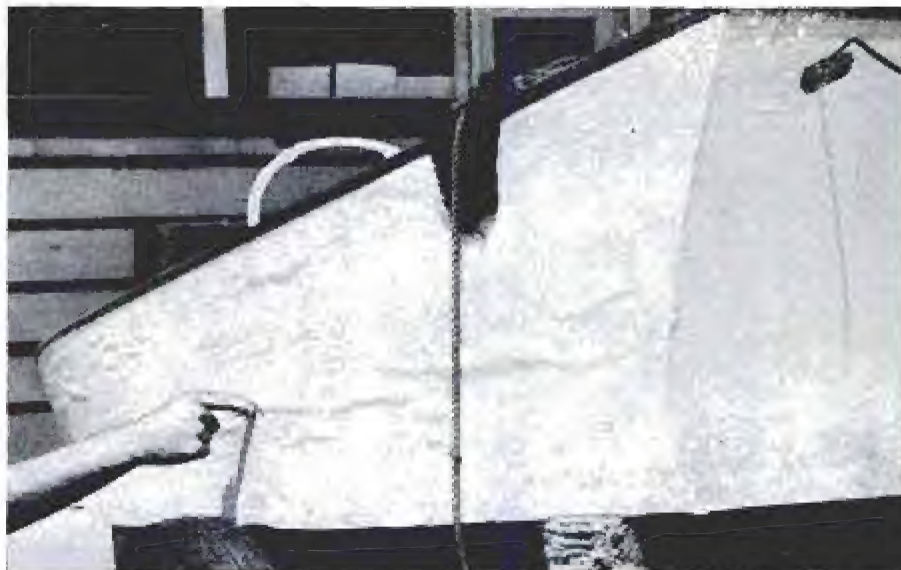


Fig. 2, above. Numerous air bubbles under glass fiber on hull are subject to easy puncturing, offer no reinforcement to hull and are eyesore that cannot be satisfactorily repaired except at considerable expense





Fig. 5. Open seams of planked boat admit rainwater that saturates unprotected wood and causes dry rot

members). One good way to check for this is to hold a straightedge against the hull as in Fig. 3. "Hooks" cause a boat to perform improperly and act as a drag, making it impossible to attain full hull speed. Be suspicious of cracks that could develop into troublesome leaks. A glass-fiber covered hull should be free of bubbles that are easily punctured, offer no reinforcement to the hull and are an eyesore that can't be remedied without great expense, Fig. 2.

Rust spots or streaks on a painted hull usually are an indication of "nail sickness," badly corroded fastenings. This may mean that the hull is in need of a costly refastening job and should not be purchased.

Chances of finding dry rot (type of fungus) in an open hull are slight. However, inspect a boat thoroughly for rot, especially if the boat has been covered and out of use for a long time, or if it has



Fig. 6. Fuel-tank leak can be detected by gasoline odor, or stained metal if area of leak is visible

enclosed spaces, such as cabins and lockers. Dry rot can be detected by probing questionable members with a dull knife blade. If the blade can be pushed into a member with little effort, it is likely to be infected and may need replacing. Be sure seams in an aluminum boat are correctly joined and do not leak. Glass boats should be free of bad cracks, and flotation tanks should be provided in both metal and glass boats.

When examining the inside of the hull, see that the frames and other structural members are sound and uncracked. A badly cracked frame will cause the planks to work and the boat to leak. Permanently installed equipment, such as heads and bilge pumps, should be checked by pumping water through them. Coast Guard-required safety equipment should be accounted for and be in usable condition, especially life preservers.

Fig. 7. Hauling heavy boat on small trailer is unsafe, may cause damage to hull

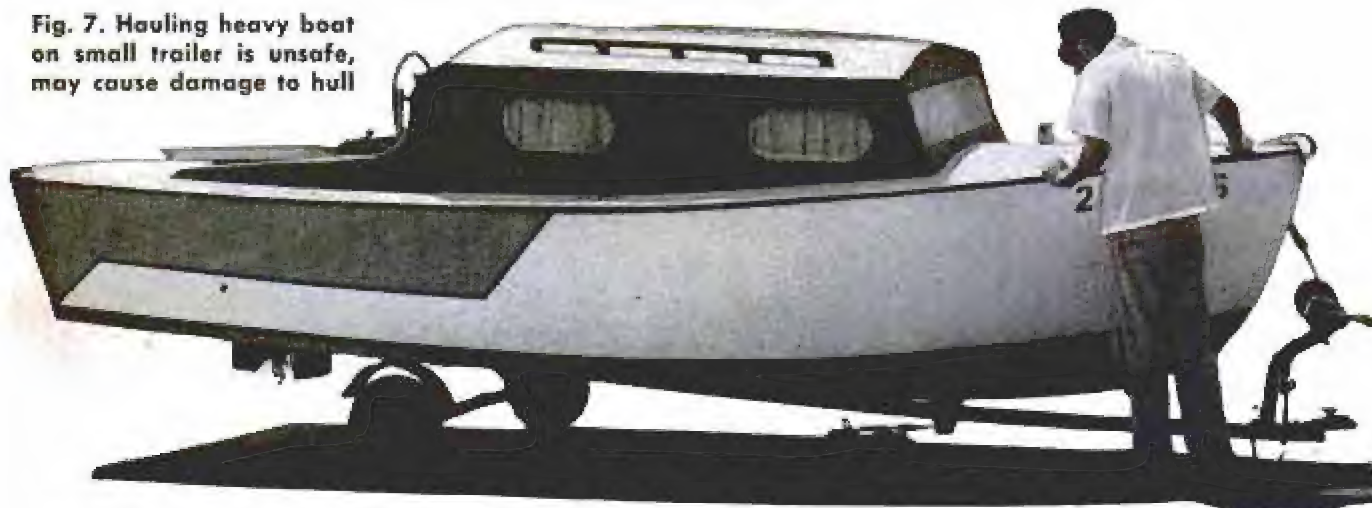




Fig. 8, above. Enclosed space below deck with clutter of damp gear is likely place to find dry rot

If one or more used out-board motors are included with the sale of the boat, test them, too. First, check the compression by pulling the starter rope and noting the amount of "pull" and "bounce" as the pistons turn through their compression strokes. Then, start the motor and note whether the slow-speed needle valves respond to adjustment. If they don't, the motor will not idle or run properly at slow speeds. Also, check the wiring, fuel connections and gasoline line for possible shorts or leaks. A careful visual check of propellers should be made noting nicks, dents or bent blades, Fig. 1. Any one of these defects may cause excessive motor vibration and power loss. Excessive vertical play of the propeller-shaft bearings or lubrication seepage are signs of worn bearings.

Many used boats are sold with trailers. To be acceptable, a trailer must be large enough for the boat, provide adequate support for the hull and have a wheel assembly in proper alignment. ★ ★ ★

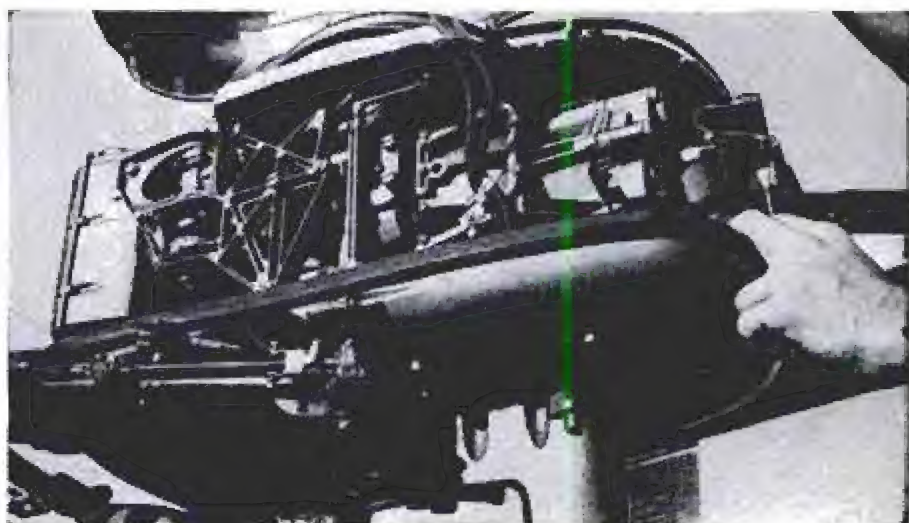
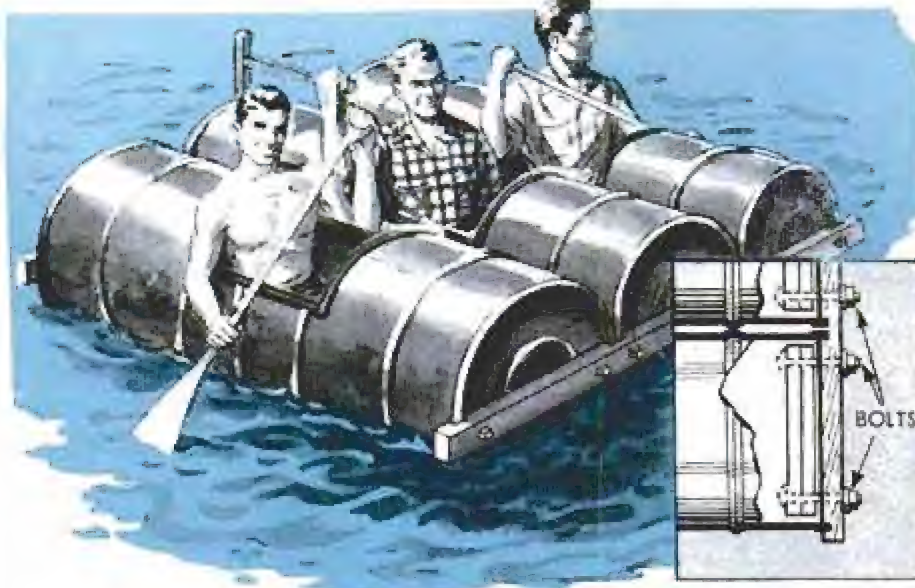


Fig. 9, above. Motor hood is removed to check fuel lines and wiring. Fig. 10, below. Trailer-tire treads badly worn at outer edges may indicate worn or loose wheel bearings, bent axles or spindles or overloading



Fun Is the Main Function of This Oil-Drum Boat



Six steel oil drums are the components of this strange craft that was designed by college students for a floating trip down the Susquehanna River. One end of each drum was removed and the drums welded end-to-end in pairs. Then an opening was cut at the center of each unit to provide a "cockpit," and rubber hose, slitted, was fitted over the sharp edges. The 3-unit assembly, bolted together on 2 x 4s, proved extremely stable.

Steel Cable Provides Useful Boat-Trailer Accessory

Tipping and swinging a boat trailer while it is still held by an automobile is done readily with this simple accessory. It consists of a $\frac{1}{4}$ -in. steel cable clamped to the underside of the trailer just ahead of the wheels. The opposite end of the cable is formed in a loop that slips over the ball of the trailer hitch. A turnbuckle in the cable permits shortening it should it stretch through use.—Capt. Joseph L. Lyon, Camp Lejeune, N. C.



Sponge Is Useful Boating Gear

Whether you have a small skiff or a large cruiser, a small sponge is a handy piece of gear to have aboard. It can be used to wipe up water and spray that cannot be removed by pump or bailing can, and is ideal for cleaning seats and decks.

Low-Cost Fenders for Outboard Boat Are Easy to Make



Fenders are a must to protect the paint and hull of any boat. An outboard owner can make his own, any of three types being simple to assemble. The first type is a length of 3-in.-dia. dowel over which carpeting is nailed. Of similar construction, but flat, is a fender made by covering a length of 2 x 6 with carpeting. They are suspended by a sash cord passed through holes drilled in the wood and tied to the gunwale. A soft fender is made by folding carpeting in a pad and covering with canvas.

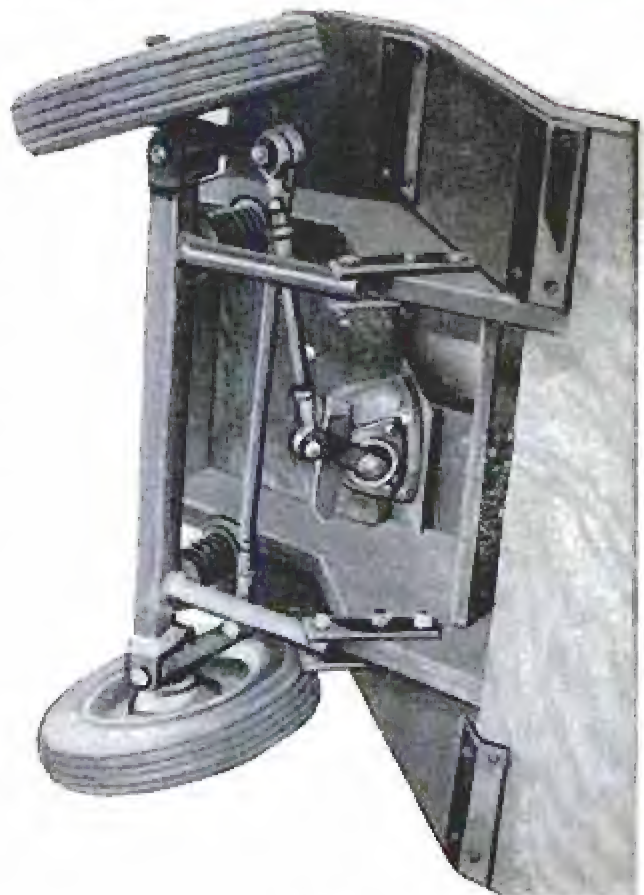


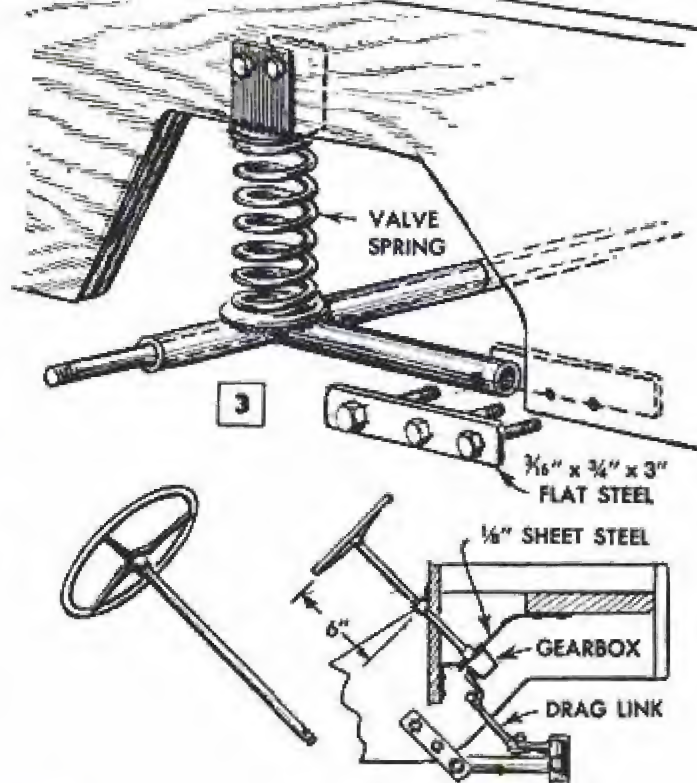
Sidewalk Jeep Has Coil-Spring Suspension

By M. C. Anderson 506 N. NORWOOD, ARLINGTON 3, VA.

AS RUGGEDLY DESIGNED as its namesake, this sidewalk Jeep will last through many a campaign of rough play. To assure maximum strength, as well as ease of construction, the body and frame members of the car, Fig. 4, are cut from $\frac{3}{4}$ -in. exterior-grade fir plywood. It is important to use exterior-grade plywood, as wood intended only for inside use does not have the weather-resistance needed for a vehicle that will be outdoors most of the time. As a further guarantee of strength, all joints are made with waterproof glue and screws. Compound curves are avoided in this Jeep design and even simple curves have been kept to a minimum.

After the body and frame have been cut out, assembled and the glue allowed to set thoroughly, the running gear is constructed. Some welding is required on the front and rear axle assemblies. If you do not have welding facilities, a local welding shop should do the job for a moderate cost after you have cut and fitted the components. The rear axle is a modified "trailing link" design, Figs. 2 and 3, with the radius rods welded solidly to the axle. The coil springs used on both the front and rear suspension are auto-engine valve springs.

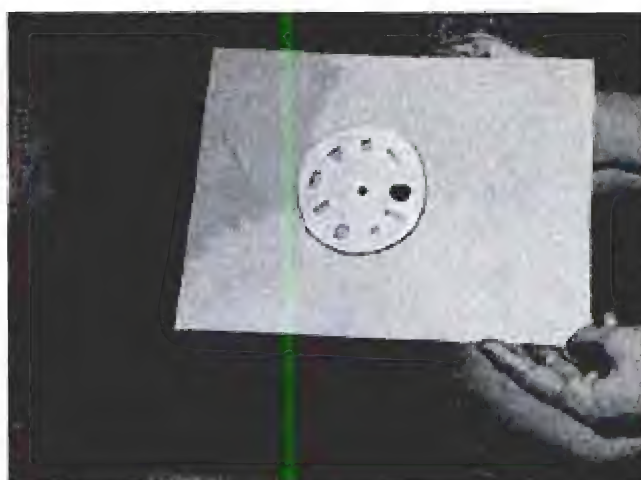




They usually can be purchased at an auto-wrecking yard, but even new ones are not too expensive. The upper end of each spring is brazed to a U-shaped bracket bent from flat steel and bolted to the car frame. The lower end of each spring is brazed to a steel washer that is welded to the axle assembly. A length of $\frac{1}{2}$ -in. steel rod, rotating inside the tubing assembly is the actual axle to which the rear wheels are attached. Cutting the rear-axle tubing at the center allows it to flex slightly when the Jeep is driven over rough ground.

The front-axle assembly, Fig. 1 and lower, right-hand detail Fig. 4, also is a modified trailing-link design. Either round or square tubing can be used. Square tubing, Fig. 1, makes assembly and alignment somewhat easier. Kingpin-support yokes welded to the ends of the front axle are steel flats bent to a U-shape. Each spindle assembly consists of a length of 1-in. round stock to which is welded a spindle — a length of $\frac{1}{2}$ -in. steel rod—and a steering arm. A $\frac{1}{4}$ -in. hole is drilled in the spindle to accommodate a $\frac{1}{4}$ -in. "kingpin." Aircraft control rods were used on the original car for the steering assembly, but can be replaced with cut-down auto tie rods and ends. The steering-gear box used on the original car was a reduction gear purchased at a war-surplus store. This unit can be replaced with a steel flat welded at right angles to the lower end of the steering column and coupled to the drag link. Changes in the steering assembly may require modifications in the sheet-metal support for the steering gear and column.

Wheels on the prototype Jeep were 10-in. semi-pneumatic, of the type sold as replacements for coaster-wagon wheels. However, wheels from a discarded wagon or other toy can be used just as well. If other types of wheels are used, check the required axle size before assembling the running gear for the Jeep. Some wheels may require a smaller or larger diameter axle. The steering wheel for the Jeep can be bent and welded from tubing or pipe, or a light wagon wheel may be utilized. To finish the car, apply a coat of sealer, then at least two coats of good enamel. Olive drab is the traditional color for a military Jeep, but a "civilian" model can sport any hue of the rainbow. Headlights can be wooden disks or shallow food tins nailed to the radiator. For a "deluxe" version, real lights powered by flashlight dry cells should be installed. Rubber mats on the floor and running boards will add a touch of individuality, and a plastic-covered seat cushion will provide a measure of comfort and luxury that is waterproof and easily cleaned when necessary. ★ ★ ★

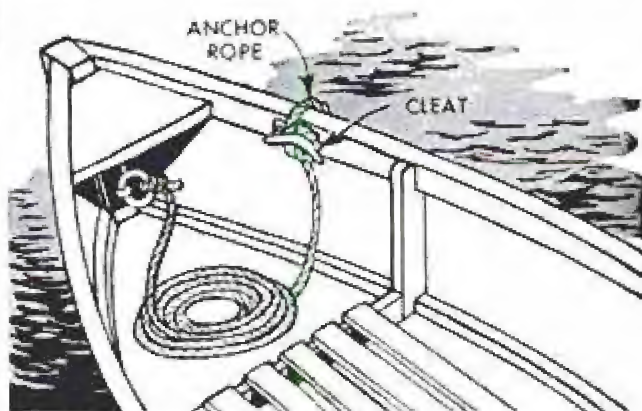


"Dodging" Card for Enlarging Has Variable Hole Selector

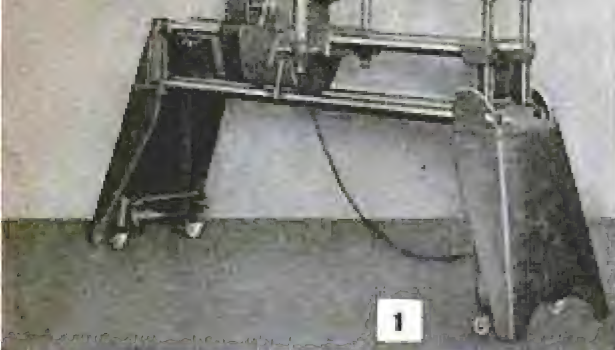
This "dodging" card for use in photo enlarging can be made in a few minutes from two pieces of cardboard. For 8 x 10-in. enlargements the large backing board should be at least 9 x 11-in. to protect the print from overlapping light. Holes of various sizes and shapes are cut in a 4-in. dial which is mounted on the card with a small bolt or rivet. The edges of the holes should be uneven, to facilitate blending of "burned" areas with the surrounding image.—Clinton R. Hull, Costa Mesa, Calif.

Cleat Controls Anchor Rope

Attached to a gunwale near the stem of a rowboat as shown, a wood or metal cleat can be used to hold the anchor above bottom temporarily to permit rowing short distances when changing fishing locations. This eliminates the need to constantly hoist the anchor in and out of the boat. The anchor rope is snubbed around the cleat a few turns, with the portion of the rope toward the anchor on top, to keep the rope tight.



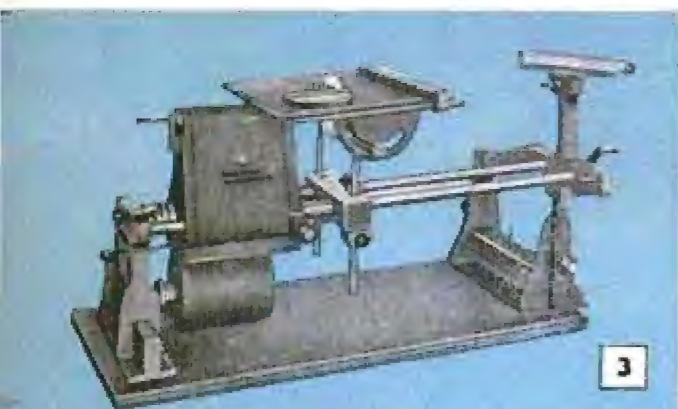
⌚ Before finishing hardwood flooring, sand it carefully. Start with No. 2 sandpaper for cutting high spots. Then use No. 1, and finish with No. 0. Use this procedure especially for close-grain northern hardwoods that require careful sanding.



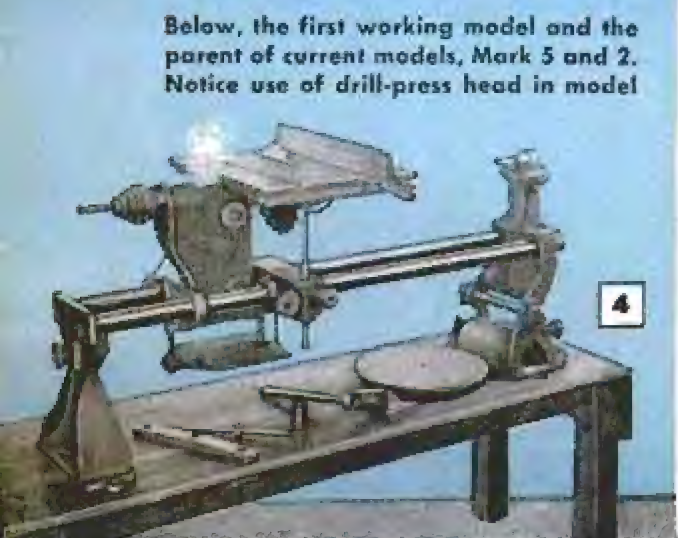
Current Shopsmith, Mark 5, is actually many tools in one. It is a precision-built tool of which any home craftsman will be proud



The new economy model Mark 2, above, is lower-priced, but will do the work of the Mark 5 model, even though it has fewer convenience features



Above, designer's first nonworking model; the first conception of the Shopsmiths to be produced at later date



Below, the first working model and the parent of current models, Mark 5 and 2. Notice use of drill-press head in model

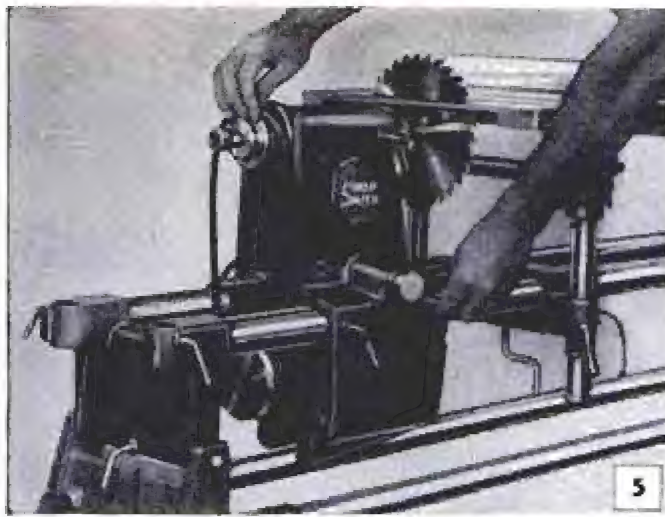
The New Mark 2 SHOPSMITH

SUCCESS OF MANY small foreign cars on the American market, as well as one or two small domestic models, has proved Americans are willing to forego some of the luxuries to save cost. It is important to note, however, that the small car was really not generally accepted until it could provide dependable transportation at practical speeds.

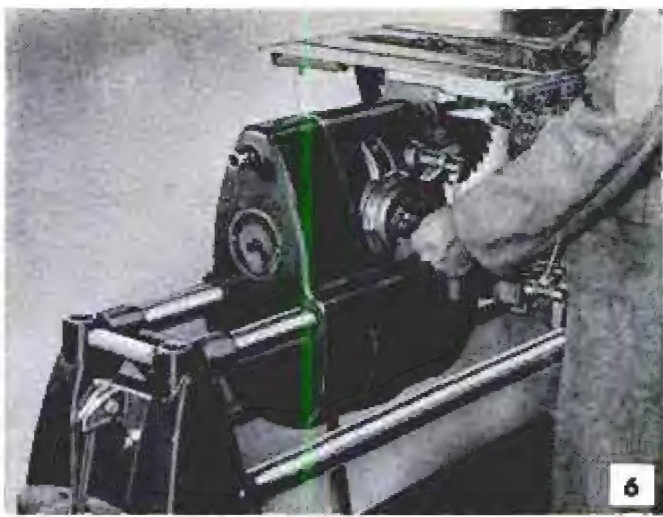
Now a manufacturer in an entirely different field—power tools—is following the same formula. Magna Power Tool Corporation has just announced a new economy-type Shopsmith. Like the smaller foreign cars, the new Shopsmith Mark 2 does not have all the luxuries of the Mark 5, but it does equally well the job for which it was designed.

The low price for the new Shopsmith naturally caused us to ask the question: How can so much be saved without forfeiting efficiency? So we invited the manufacturer to explain how this problem had been approached and what was accomplished.

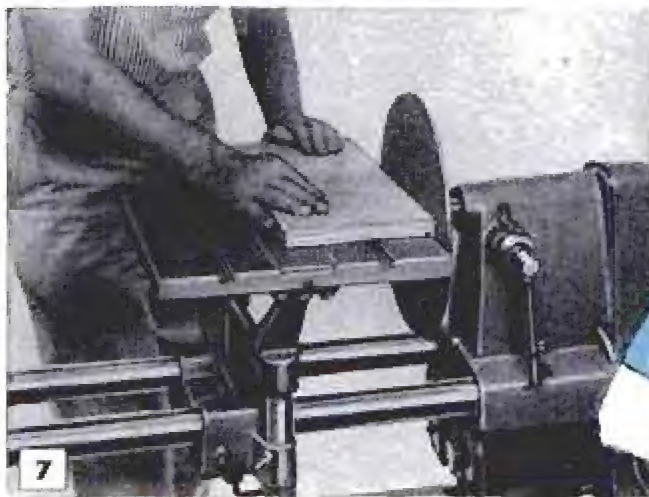
The results are shown on this and the four pages following. Descendants of the first nonworking-model mockup pictured in Fig. 3, and later the working model shown in Fig. 4, the current, higher-priced model, Mark 5, is pictured in Fig. 1, and the new economy model, Mark 2, is shown in Fig. 2. A quick glance shows little difference in the two models, design in general as well as accuracy and



Changing speeds on Mark 2 is merely a matter of loosening belt tension and shifting belt to the various pulley combinations of two step pulleys



Desired speed is dialed on Mark 5. An expandable pulley on motor shaft is widened or narrowed by dial mechanism to increase or decrease pulley dia.



Replacing the saw blade with a sanding disk provides a disk sander which, when used in conjunction with table, does accurate edge sanding

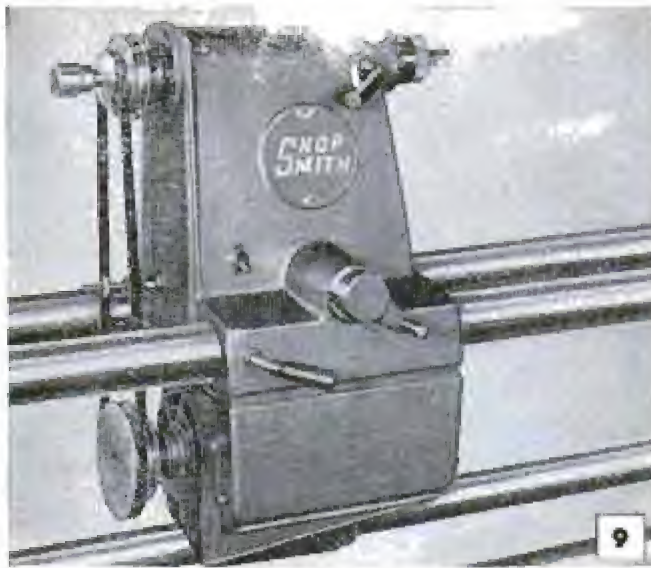
Right, the bandsaw accessory, as do all accessories used on the Mark 5, also fits the new Mark 2. It is driven through the mandrel shaft by a coupling

rugged construction being maintained. Accessories for the higher-priced model also are used on the economy-priced model. Close inspection shows how lower costs for the new Shopsmith were made possible without sacrificing quality. Like the small-car manufacturer who holds down costs by using a "stick shift" instead of an automatic transmission, and eliminates power assists and gadgets considered a convenience, the manufacturer of the new Shopsmith reduced costs by using a simple drive and eliminating some of the unnecessary convenience features from the tool.

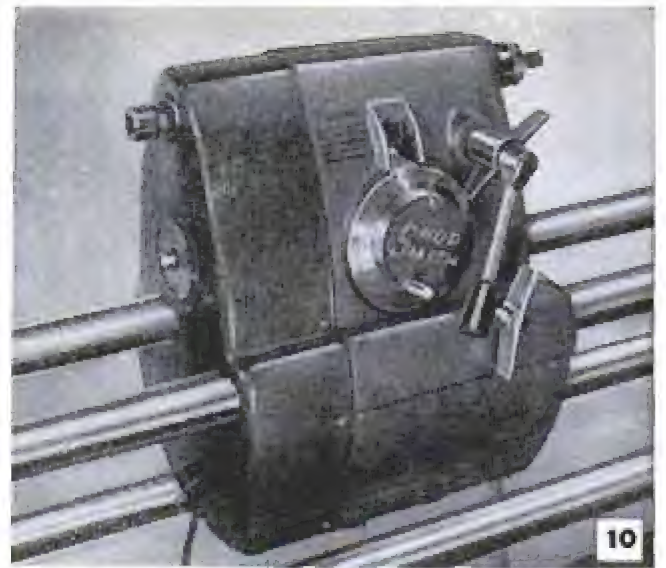
Figs. 5 and 6 show the drives of the two tools. To change speeds on the Mark 2, the belt is shifted on the pulleys by hand, Figs. 5 and 17, while on the Mark 5, speeds are changed by rotating a dial as in Figs. 6 and 16.

As with the car's automatic transmission,

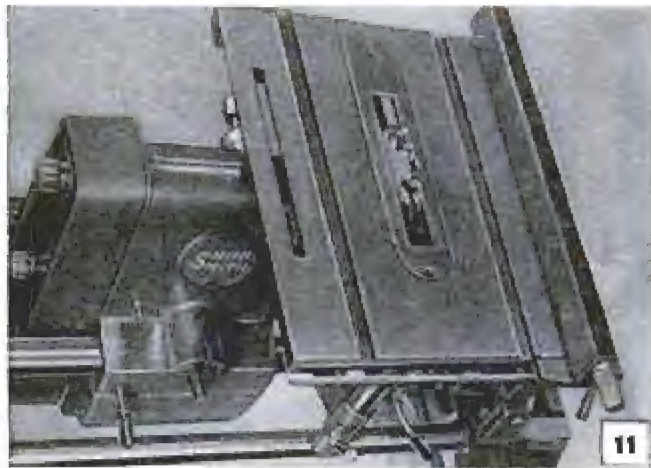




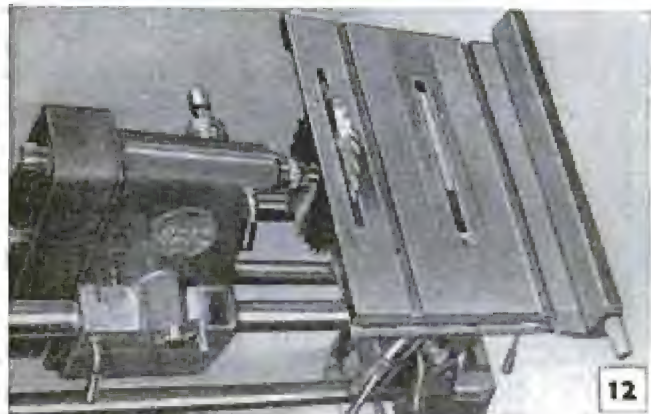
9



10



11



12

9. Step pulleys in drive permit many shaft speeds, which are obtained by shifting belt to various pulleys

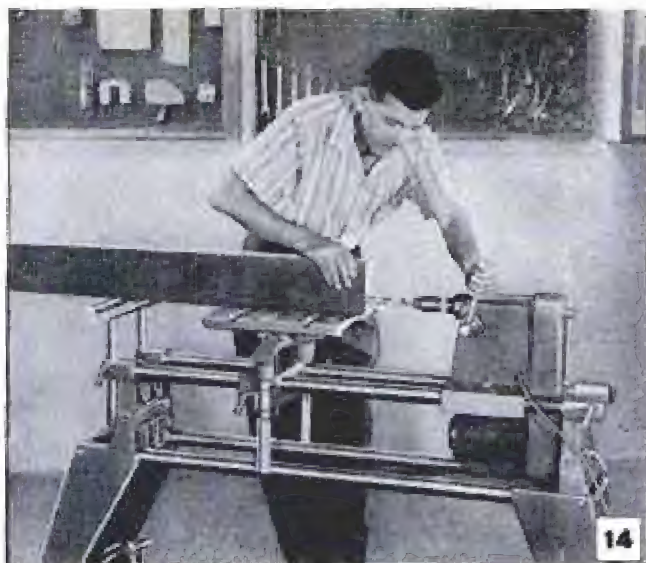
10. Speeds on Mark 5 changed by calibrated dial, which actuates expandable pulley to change its dia.

11 and 12. Table on Mark 2 has two slots. One at left permits wider work on table than center slot

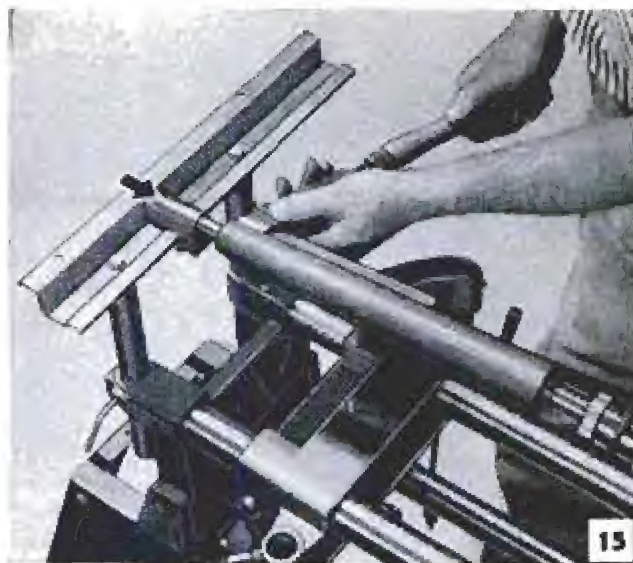
13. By using the auxiliary table, unusually long work can be handled on either of the Shopsmith tools



13



The two tables support long work for accurate horizontal drilling. Table-height adjustment makes it easy to spot the drill point exactly where desired

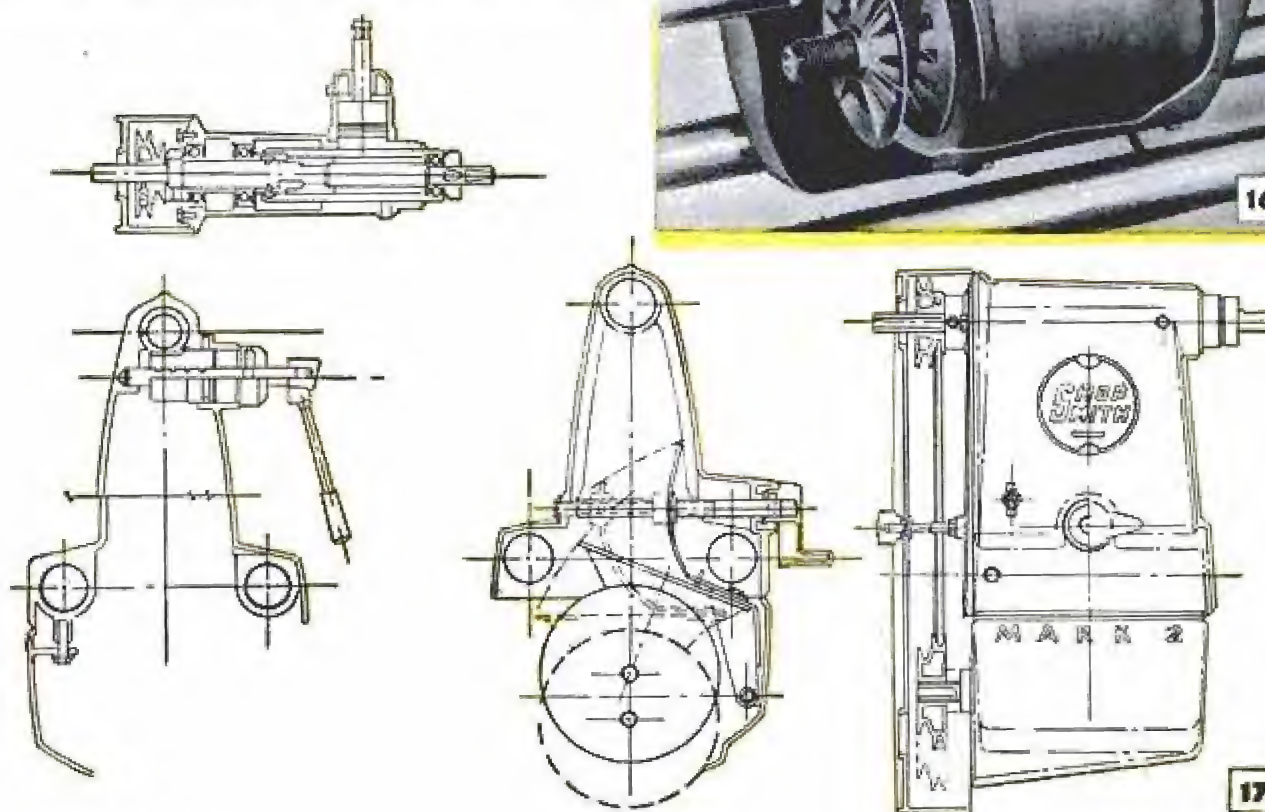
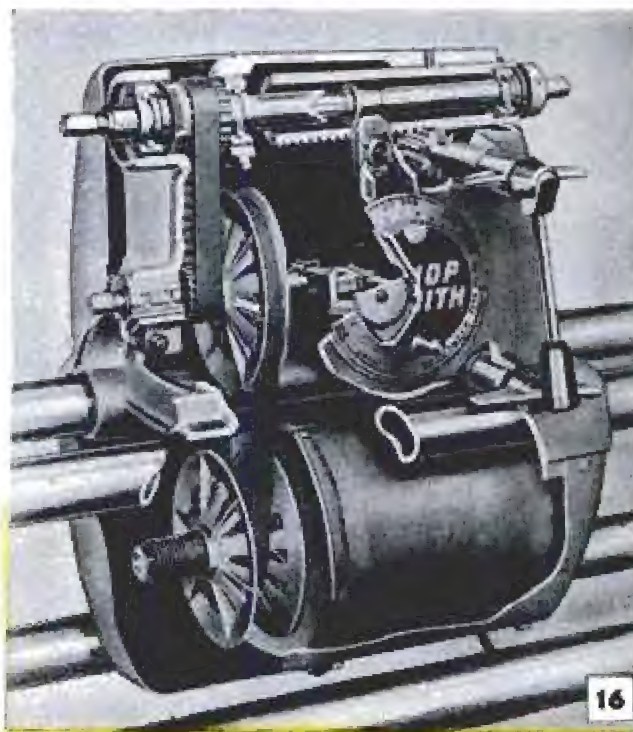


Tailstock center slides on support to get the necessary "setover" for taper turning. Casting holding center clamps to auxiliary table for quick adjustment

dialing the speed of the tool is a convenience, but is not necessary to doing quality work with the tool. Other cost-reducing features are shown in Figs. 9 and 10. Notice the difference in the control knobs of the two tools. Those on both tools accomplish the same purpose, but those on the Mark 5, Fig. 10, have a more deluxe appearance, and have position-locking features, while those on the Mark 2, Fig. 9, are merely screws with plastic handles.

Further cost-reducing features were effected in the table-raising mechanism on

Right, an expandable pulley on the motor shaft operated by a dial changes speeds on the Mark 5. Below, the belt-and-pulley drive used on Mark 2





Belt-sander accessory, as are all accessories, is driven from end of mandrel shaft as shown above

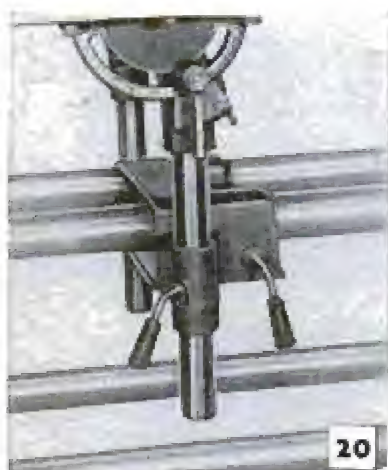


Both Shopsmiths convert to vertical drill presses, which provide conveniently wide tables, above

the Mark 2. The Mark 5 utilizes a rack and pinion, Fig. 21, while with the economy model, rapid raising is done by hand. Micro-adjustment of the table for critical setting is provided by a screw crank which can be seen just below the table in Fig. 22.

Although not shown for the sake of clarity, an arm clamped to one of the table standards projects out over the end of the crank, to adjust the table for height.

As indicated in Figs. 11 and 12, the table on the Mark 2 has two slots, one centered



Mark 2 table-adjustment controls are plastic-handled screws

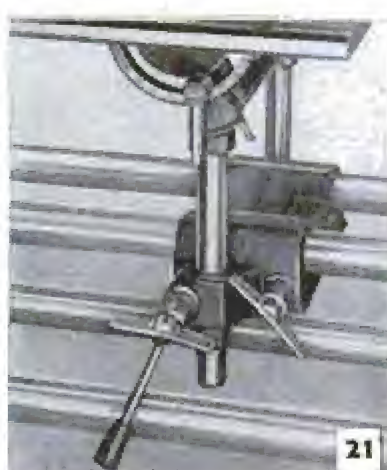
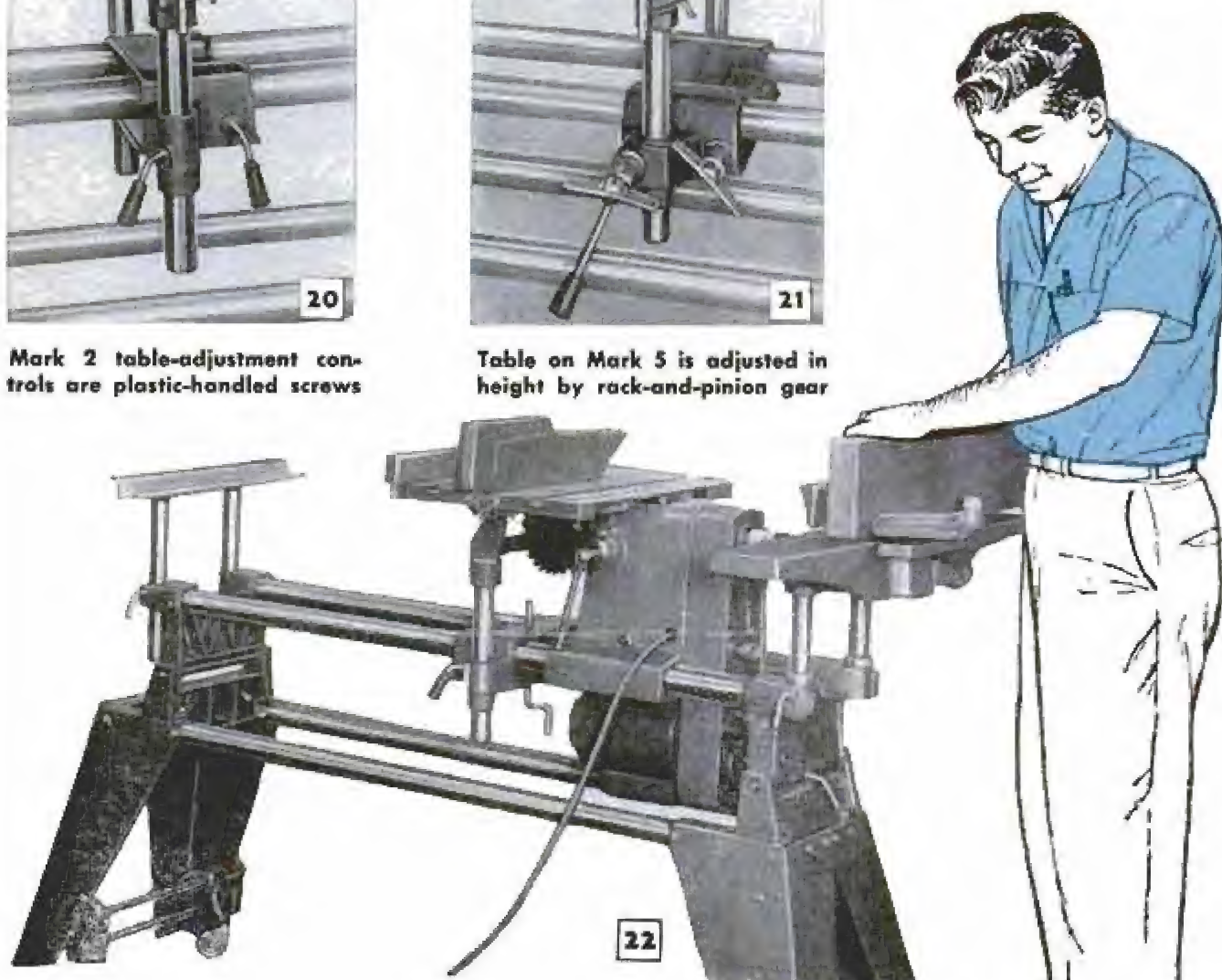


Table on Mark 5 is adjusted in height by rack-and-pinion gear

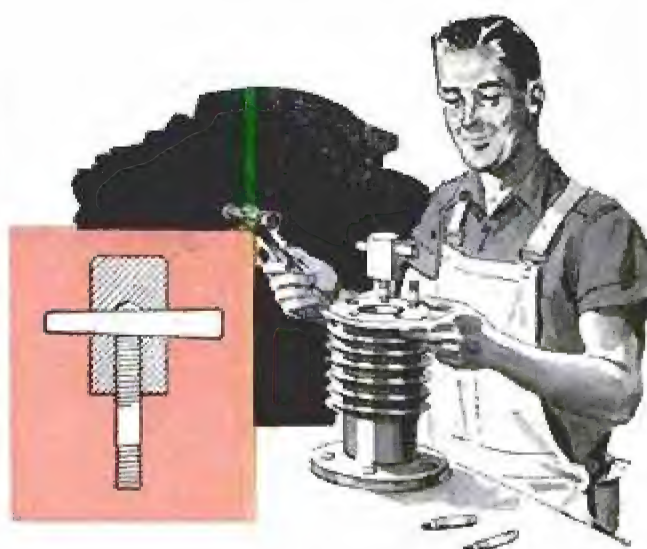
Below, motor on Mark 2 has plenty of power to operate all accessories used on the Mark 5



and one near the left edge. Use of the left slot permits wider work between saw blade and the rip fence, Fig. 12, when the fence is on the table.

Where the Mark 5 has a cast, deluxe, auxiliary table, or long-work support, on which the rip fence also may be used, the economy model has a simpler stamped one, which is shaped so it also serves as a rip fence, as in Fig. 13. When the Mark 5 is used as a wood-turning lathe, the auxiliary table is replaced with a special tailstock, which carries a fitting to hold the center. This fitting can be rotated to set the center for taper turning. On the Mark 2, the tailstock center is held in a small casting that slides on the auxiliary table as indicated by the arrow in Fig. 15.

As with the Mark 5 Shopsmith, the Mark 2 model can be used as a wood-turning lathe, Fig. 15, a horizontal drill press, Fig. 14, or a vertical drill press as in Fig. 19. The economy model also operates various accessories used on the Mark 5, such as a disk sander, Fig. 7, a bandsaw, Fig. 8, a belt sander, Fig. 18, or a jointer as in Fig. 22. ★ ★ ★



Easy-to-Release Stud Driver

This stud driver is made by drilling and tapping a length of steel hexagon bar, then cross-drilling the bar near the upper end of the threaded hole. The latter hole is reamed with a No. 1 Morse-taper reamer. A Morse-taper shank from a discarded drill then is tapped into the hole. After a stud is driven, tapping out the shank releases the driver and stud.

C. W. Woodson, Chicago.

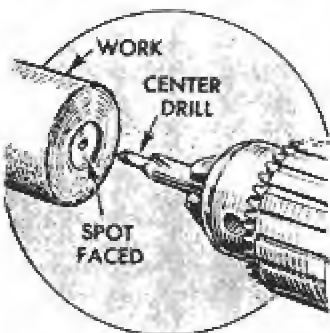
Stair Stringers Marked Accurately With Square and Strip



When marking stair stringers one carpenter clamps a straight strip of wood across a framing square so the distances from the corner of the square to the strip will equal the lengths of cuts to be made for treads and risers. The square is moved from one marking position to the next, with the wood strip held snugly against the edge of the stringer. For accurate results with this method, it is necessary, of course, that the edge of the stringer be perfectly straight. Both stringers are cut at the same time to assure identical units.

For Accurate Center-Drilling

Rough forgings have a draft angle on the ends, and center drilling them without preparation will produce elongated holes



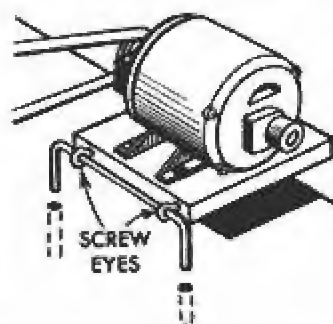
that will cause the forging to run out-of-round when set up in a lathe for turning. To avoid this problem, spot-face the ends in one of several ways. The ends can be faced-off in a lathe, smoothed with a belt sander

or milled, depending on the shape of the workpiece and availability of machinery.

Frank La Saracina, New York City.

"Portable Mounted" Motor

When a small electric motor is used to drive several machines in your shop by moving it from one location to another,



it can be anchored securely at any point by first mounting it on a wooden block. The block is fitted with a U-shaped hinge rod at the machine side of the motor as indicated. Holes drilled in the bench at the desired location for each machine permit the insertion of the ends of the rod. Locate the holes so the motor hangs on the belt.



CUTTING BREAD SLICES of equal thickness is easy when board is ruled with guide lines



NUT

Solving HOME PROBLEMS



TO RENEW BRISTLES of some types of brushes that have vegetable-fiber bristles, soak them in a saline solution, then dry thoroughly. Bristles again will be stiff

GLASS STOPPERS will not "freeze" in medicine bottles if they are wrapped with a strip of adhesive tape that acts as "gasket." Permits easy removal

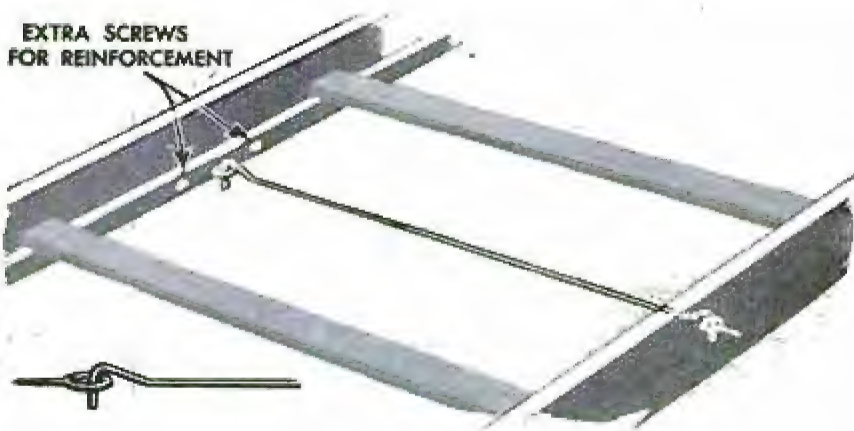


CLEANING OVERSHOES with a vacuum cleaner when they are dried between wearings will remove dust and dirt that often spoils fresh shoeshines and socks



◀ **FLUSH-TANK FLOAT** will have faster, more positive action when weight is added to it. Weight consists of ½-in. nut fitted on stem of float as in the detail, left

EXTRA SCREWS FOR REINFORCEMENT



▶ **DOUBLE-ENDED HOOK** long enough to span width of bedframe and fit in screw eyes driven into rails will keep rails from bowing out and allowing slats to drop



ADHESIVE TAPE

SPREADING LIQUID WAX on a floor is simpler, quicker and less wasteful when a clothes-sprinkler head is forced into neck of the can to make it into a dispenser



◀ **MINIATURE CLIPBOARD** is made by removing trigger and catch from ordinary mousetrap, then painting it. Screwed to wall or door it is handy for receipts, bills

DOWEL IN HEM of cloth used for damp-pressing garments provides means for easier handling, permits cloth to be spread smoothly over garment to be pressed



"Disposable" Funnel Improvised From Beverage Container



When no funnel is available, one can be improvised by removing the bottom from a beverage can. The can must be of the type with a narrow mouth that is sealed with a bottle cap. Even heavy liquids, such as oil and paint, pour rapidly through this handy "disposable" funnel.

Ventilator for a Doghouse

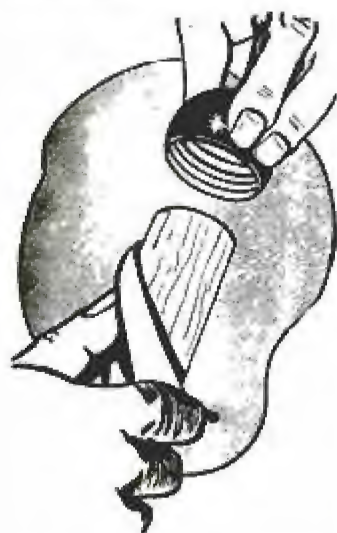
To provide rain-proof ventilation for a doghouse, install this "louver" made from a 1-lb. coffee can. The can is cut in half, then the edge is notched and bent as indicated to form tabs. Cut a semicircular opening in the doghouse large enough to accommodate the louver, then insert the louver from inside the house and nail it in place.



Corks in Drawing Board Provide "Renewable" Surface

Constantly using the same size paper on a drawing board results in four small areas that become pitted and roughened from the thumbtack holes. To avoid this, drill large holes at the points where frequent perforations occur and fit fine-grained corks in the holes, sanding them level with the board. Now, when these areas become pitted, the corks are removed and new ones inserted.

Ornamental Flagstaff Tips



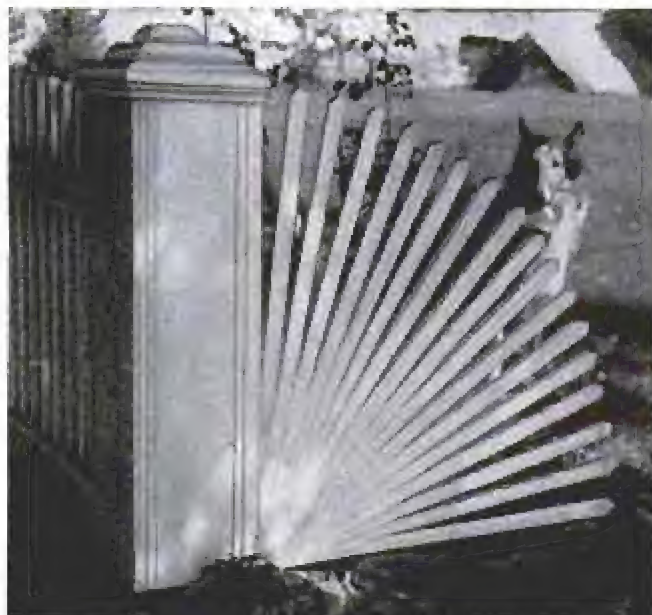
Fancy plastic and metal caps used on perfume, cologne and other cosmetic bottles are ideal for use as ornaments to dress up an otherwise plain flagstaff. Trim the end of the staff so the cap must be forced on, then apply waterproof cement inside cap and press over end of staff.

Diagnosing Choke Trouble

Damage to the hot-air tube in an automatic choke can result in carbon building up in the mechanism and causing trouble. If a malfunctioning automatic choke shows signs of excess carbon, corrosion or burning, replace the hot-air tube.

Fan-Shaped Panel "Trims" Fence

Assembled from the same size pickets that are used in the fence, this fan-shaped panel is fitted at right angles to the end of the fence to eliminate a "chopped-off" look. The lower ends of the pickets were tapered to make a tight fit at the fan base.

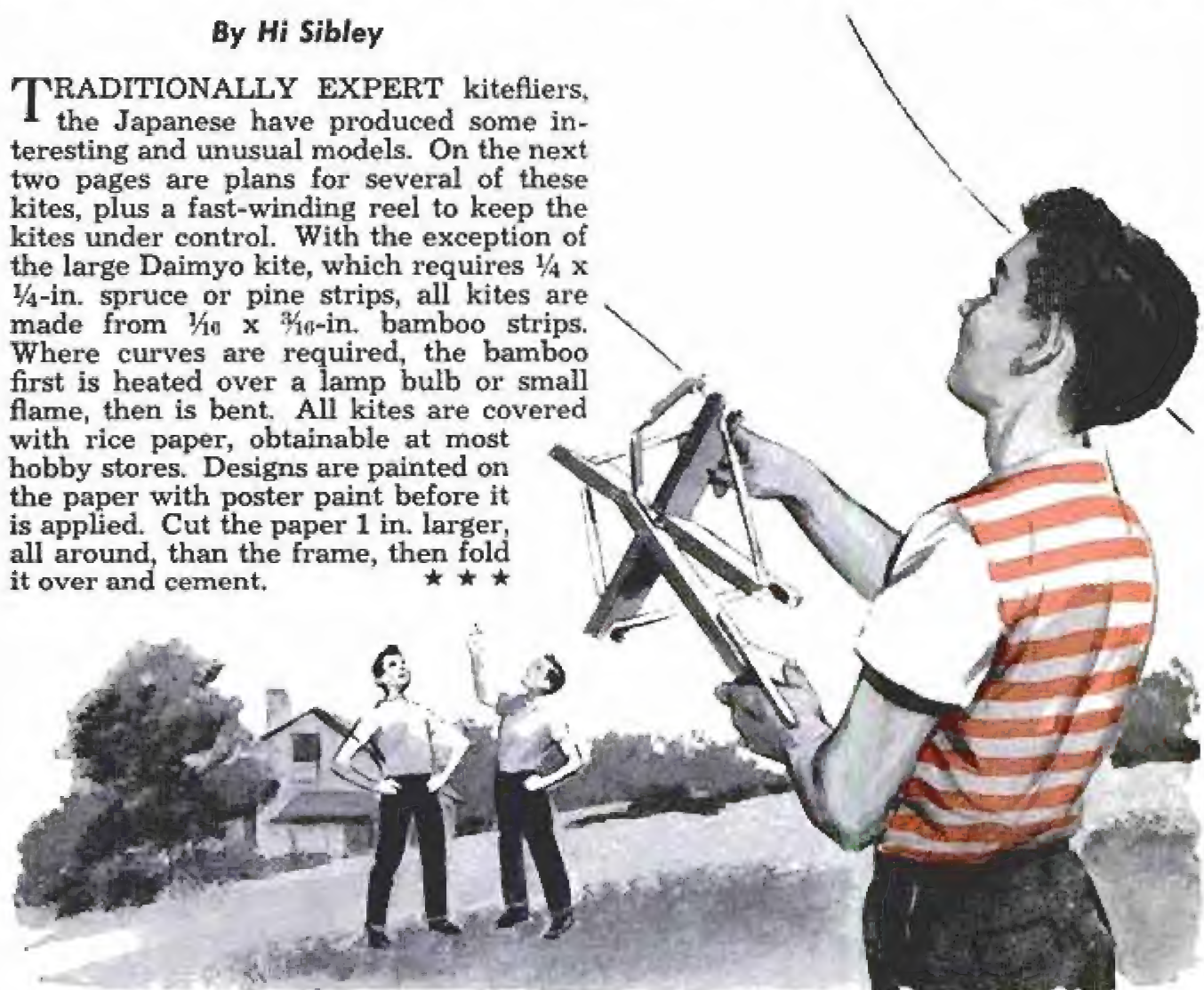




HIGHFLYING LIGHT KITES FROM JAPAN

By Hi Sibley

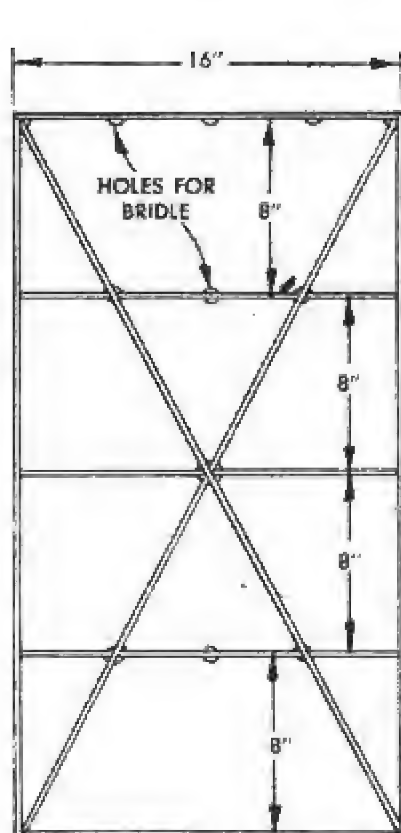
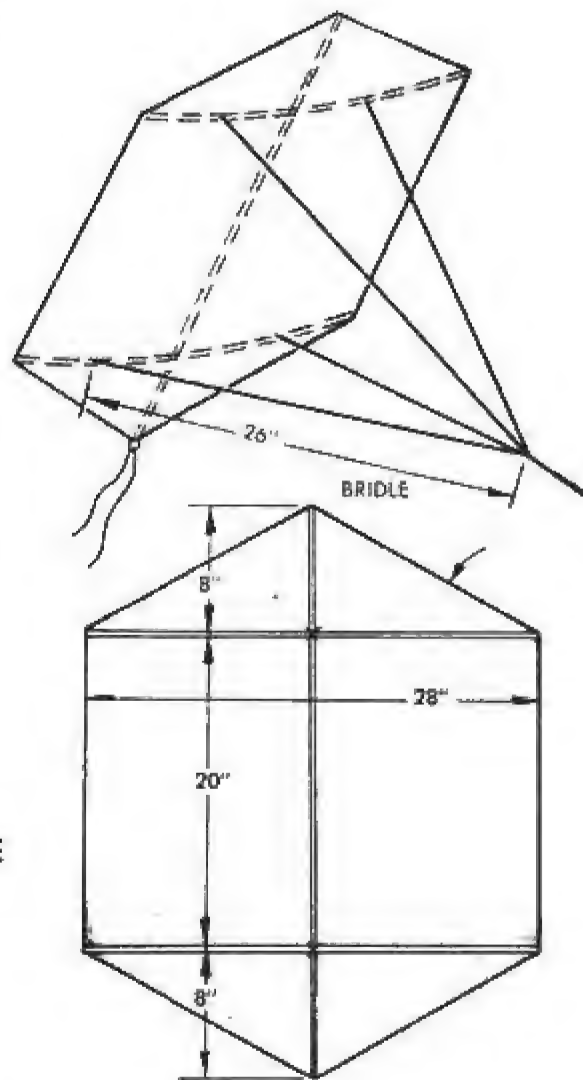
TRADITIONALLY EXPERT kitefliers, the Japanese have produced some interesting and unusual models. On the next two pages are plans for several of these kites, plus a fast-winding reel to keep the kites under control. With the exception of the large Daimyo kite, which requires $\frac{1}{4}$ x $\frac{1}{4}$ -in. spruce or pine strips, all kites are made from $\frac{1}{16}$ x $\frac{3}{16}$ -in. bamboo strips. Where curves are required, the bamboo first is heated over a lamp bulb or small flame, then is bent. All kites are covered with rice paper, obtainable at most hobby stores. Designs are painted on the paper with poster paint before it is applied. Cut the paper 1 in. larger, all around, than the frame, then fold it over and cement. ★ ★ ★



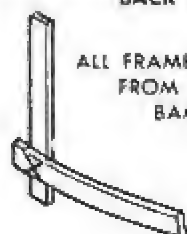
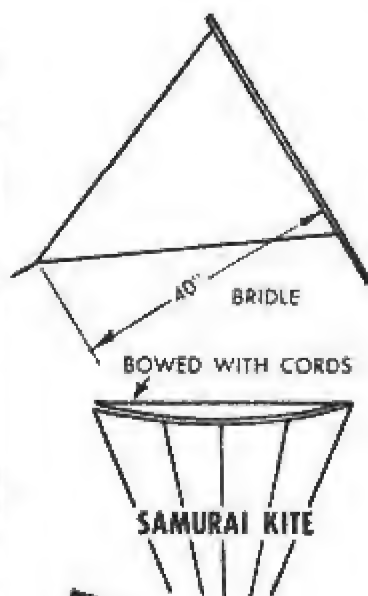


2" SQS.

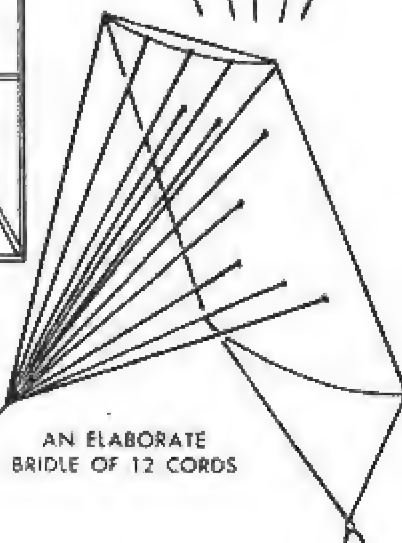
DAIMYO KITE



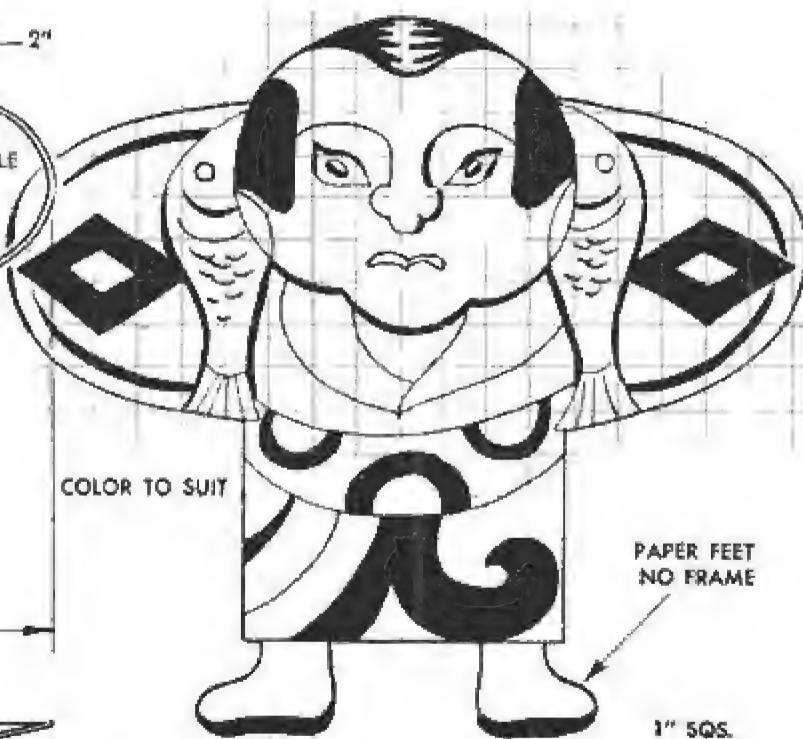
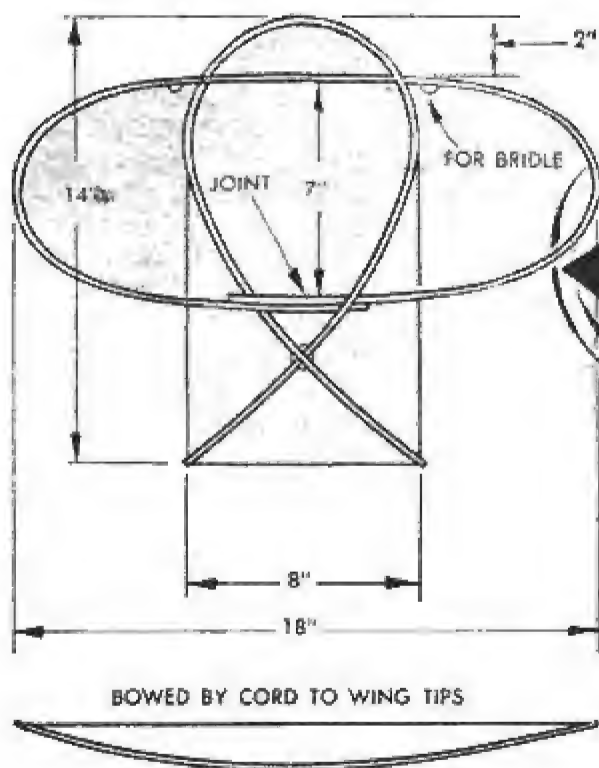
BACK VIEW



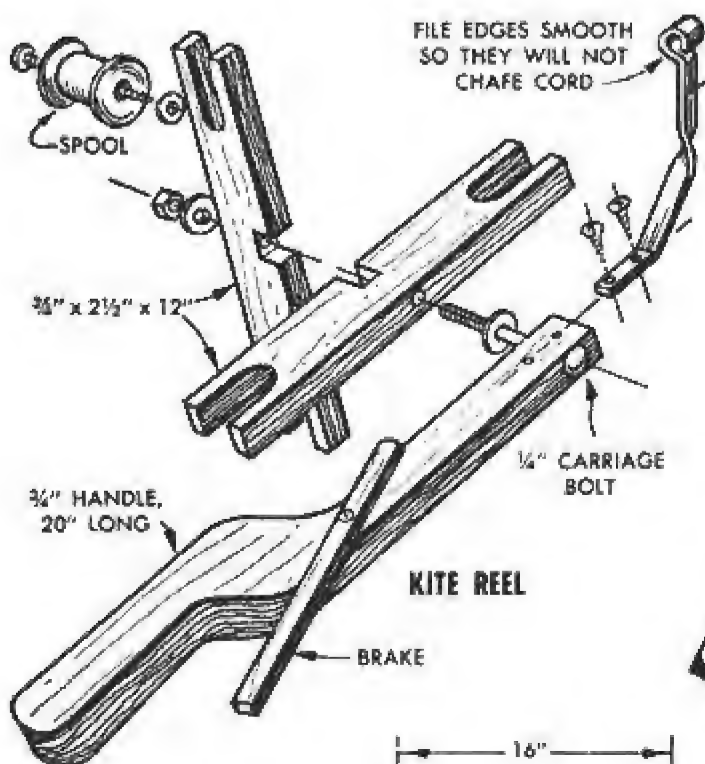
ALL FRAMES ARE MADE FROM $\frac{1}{16}$ " x $\frac{3}{16}$ " BAMBOO



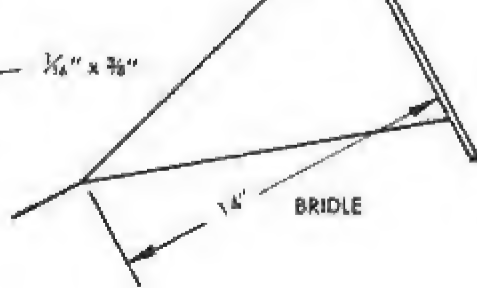
2" SQS



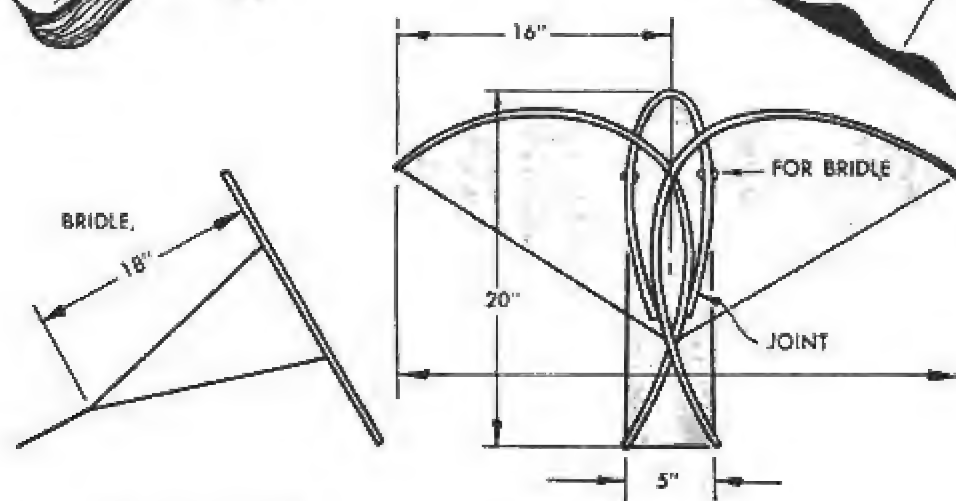
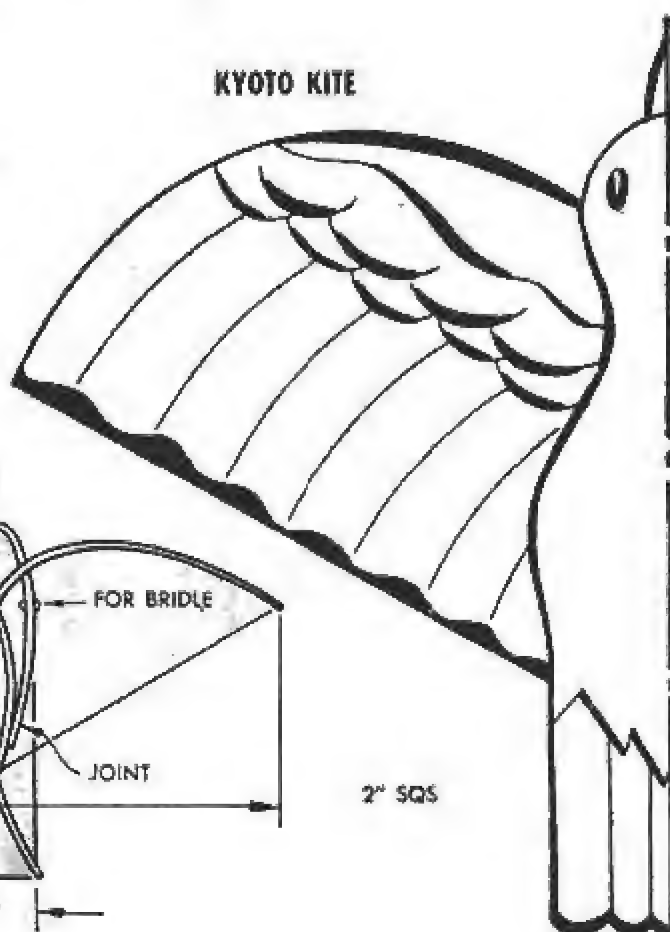
NIKKO KITE



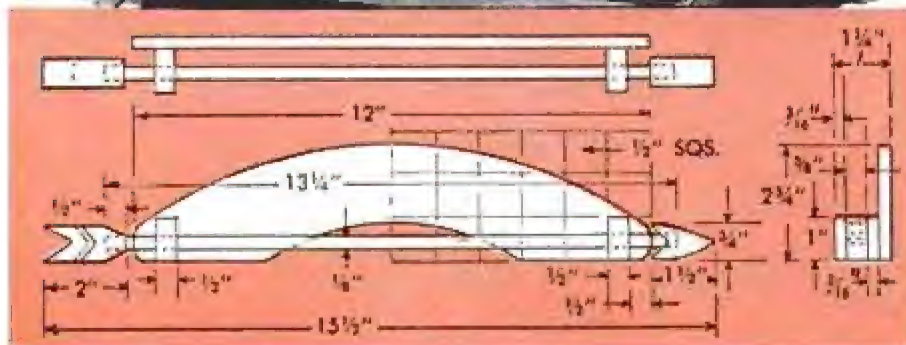
KITE REEL



KYOTO KITE

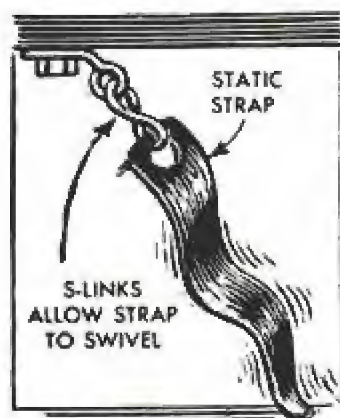


"Bow and Arrow" Tie Rack Is Simple Jigsaw Project



Novel in appearance, this "bow and arrow" tie rack is easy to make. Power tools will permit you to "mass produce" them for gifts or sale, but single units can be made with ordinary hand tools. The bow-shaped back of the rack is cut from $\frac{1}{4}$ -in. plywood, the arrow-head and feather are cut from $\frac{3}{4}$ -in. stock. For an added touch, the arrow-head can be carved to appear more realistic. The shaft of the arrow is a length of $\frac{3}{8}$ -in. dowel. Blocks used to support the arrow can be assembled from three small scrap pieces, as indicated, or a single piece of solid stock may be drilled to accommodate the arrow shaft. Head and feather are drilled and glued to the shaft last.

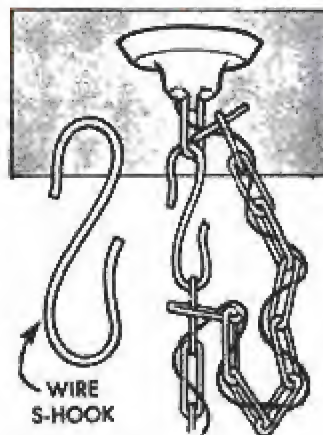
Static-Eliminator Strap Pivoted



If the strap used to eliminate static electricity from your car or truck breaks off frequently, it probably is due to the fatigue induced in the material by the constant flexing at the point where it is bolted to the frame. To eliminate this

factor, attach the strap with two S-shaped chain links as indicated, using one link to bolt the strap to the frame, the other to provide a pivoting, semiswivel connector.

Raising Overhead Light Fixture



If a table is temporarily moved from beneath a low-hanging overhead light, such as when cleaning floors, the light should be raised above head level to prevent someone striking his head against it. Where the light is suspended from a

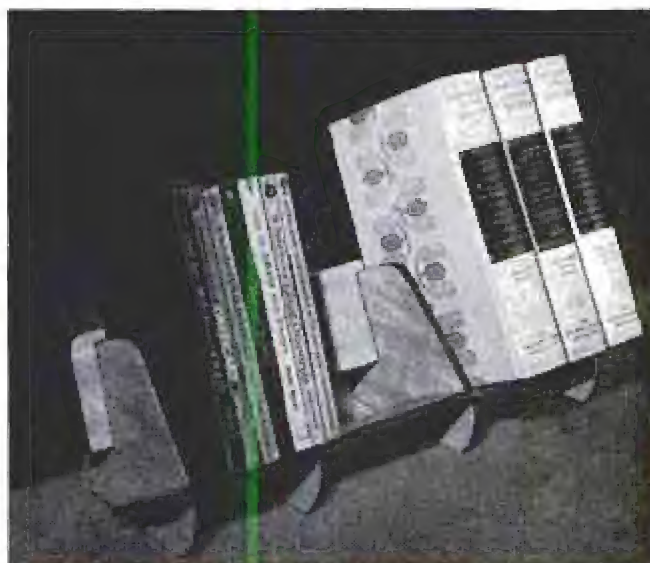
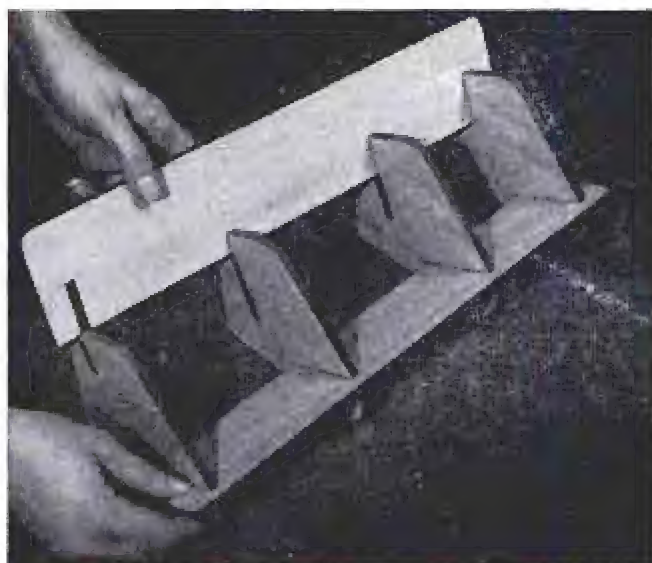
chain, as is customary with most older-type fixtures, an S-hook of heavy wire can be used to elevate the light. This method requires no alteration of the light fixture.

Wire Covering "Solder-Proofed"

To solder terminals on electric wires without burning the insulation, wrap the latter with steel wool, held in place with a spring-type wooden clothespin. The steel wool will absorb heat from the soldering iron, thus preserving the insulation. If you solder with an open flame, do not use this method as the steel wool might ignite, but instead, use a heavy wrapping of asbestos cloth around the insulation.

Coins Used as Gasket Patterns

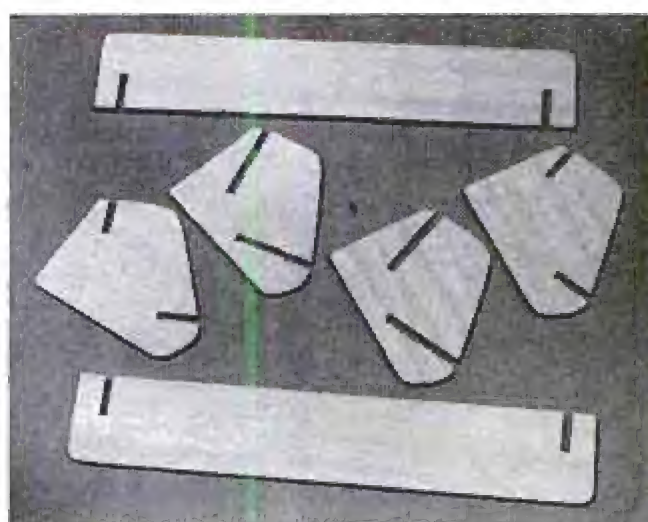
Coins make ideal patterns for cutting circular gaskets of rubber, leather or other soft materials. Place a piece of the gasket material between two coins of the correct size and cut around the edge with a sharp knife or razor blade. The diameters of the various coins are as follows: Penny, $\frac{3}{4}$ in.; nickel, $\frac{13}{16}$ in.; dime, $\frac{11}{16}$ in.; quarter $\frac{15}{16}$ in.; half-dollar, $1\frac{1}{16}$ in.; silver dollar, $1\frac{1}{2}$ in.—W. R. Beasley, Jackson, Mich.



Above, adjustable bookrack consists of back, bottom and four uprights, two of which slide for adjustment

Adjustable Bookrack For Table or Desk

This attractive little bookrack, made of six interlocking hardboard members, has space for two or three reference books and several other books that you'd like to have within easy reach on a desk or table. The movable dividers permit displaying books in separate groups for easy selection. No glue, nails or screws are necessary for assembling it since the slots permit the pieces to interlock securely. The members of the rack shown in the photos were cut from hardboard scraps with a simulated wood-grain finish on one side. The unfinished surfaces are painted a blending color. Also, plywood or any other suitable material may be used and finished as desired. The rack shown is 15 in. wide, 4½ in. high and 5 in. deep. These dimensions can be altered as desired to provide more or less space for books. Members that are to receive matching slots—back and bottom, two end pieces and two adjustable or sliding verticals should be clamped together in their respective pairs when cutting the required slots



Slots that interlock at ends of rack are 1¼ in. long, slots in two sliding verticals are twice as long

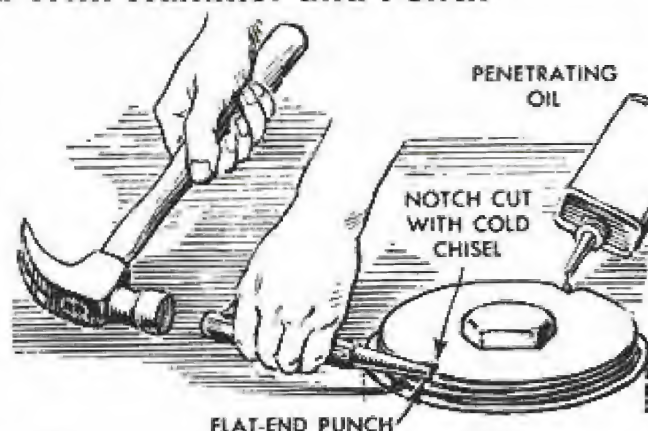
for proper alignment. The width of all slots is equal to the thickness of the stock used. Slots that interlock at the ends are 1¼ in. long. Slots in the two adjustable verticals are twice as long as the slots in the end members. Edges are sanded smooth, using a fine grade of sandpaper, and painted a blending color.

Photos and information courtesy Marsh Wall Products, Inc.

"Frozen" Drum-Trap Cover Loosened With Hammer and Punch

When attempting to remove a "frozen" drum-trap cover in a bathtub drain, try tapping it loose with a hammer and punch as shown in the drawing. The notches are cut so that the striking surfaces are 180 deg. apart and face in opposite directions. This permits tapping the cover in alternate directions for easier loosening of the frozen threads. After the cover is removed, clean the threads on it and the trap and coat them with lubricating grease to assure easier removal of the cover at some future date.

E. R. Haan, Evanston, Ill.



By Dick Hutchinson



Garden Cart Has Lift-Out Basket

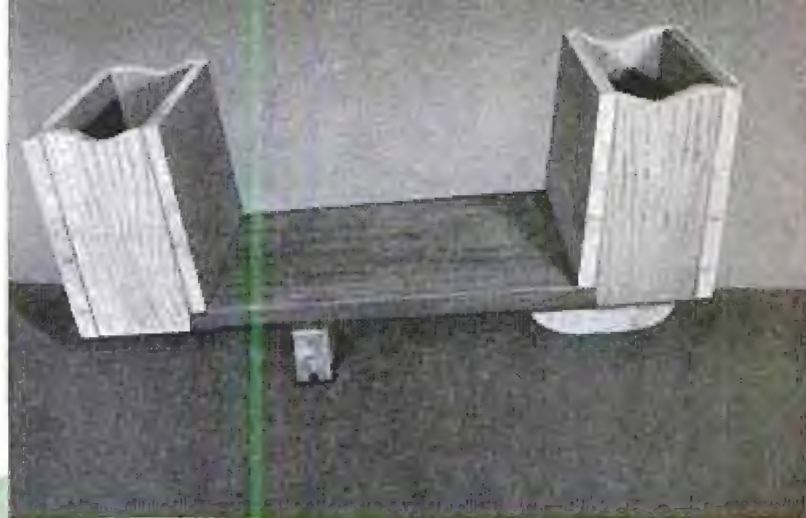
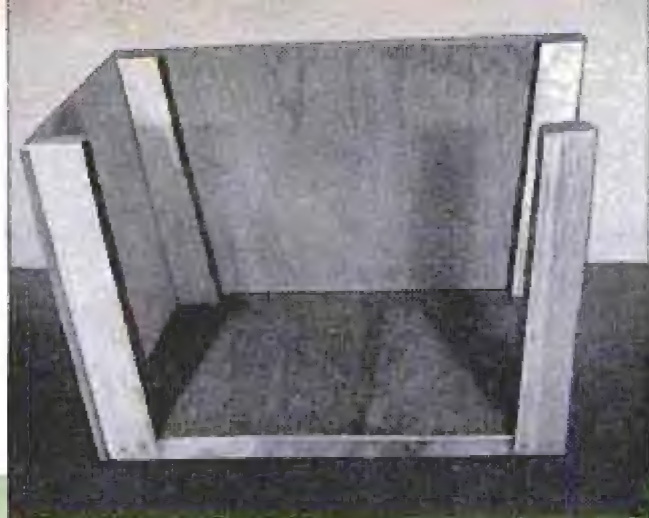
ANY LADY GARDENER will appreciate this carry-all garden cart that is even more useful than it is attractive. Compartments in each end of the cart permit carrying garden tools, while the center basket is removable. This latter feature permits the basket to be emptied easily when it is filled with weeds, or to be carried into the house or basement when

filled with potted plants that must be wintered indoors. Salvaged wheels from a discarded wagon, tricycle or doll carriage may be used for the cart. In the detail, a $\frac{1}{4}$ -in. steel rod is suggested for the axle. This may vary with different sizes of wheels. The cart frame and components are cut from $\frac{3}{4}$ -in. plywood or 1-in. solid stock ($\frac{3}{4}$ in. when finished). Framing of the

basket is $\frac{3}{4}$ -in. stock, the covering is $\frac{1}{4}$ -in. plywood or hardboard. To accommodate the basket, both end compartments slant at an angle of 82 deg. The ends of the pieces used for the compartments are cut at this angle. After the compartments have been installed, draw a diagonal line from the outside upper corner to the lower inside corner of each compartment end and install the vertical handle members on the lines. Other members between the handles hold the basket. ★ ★ ★

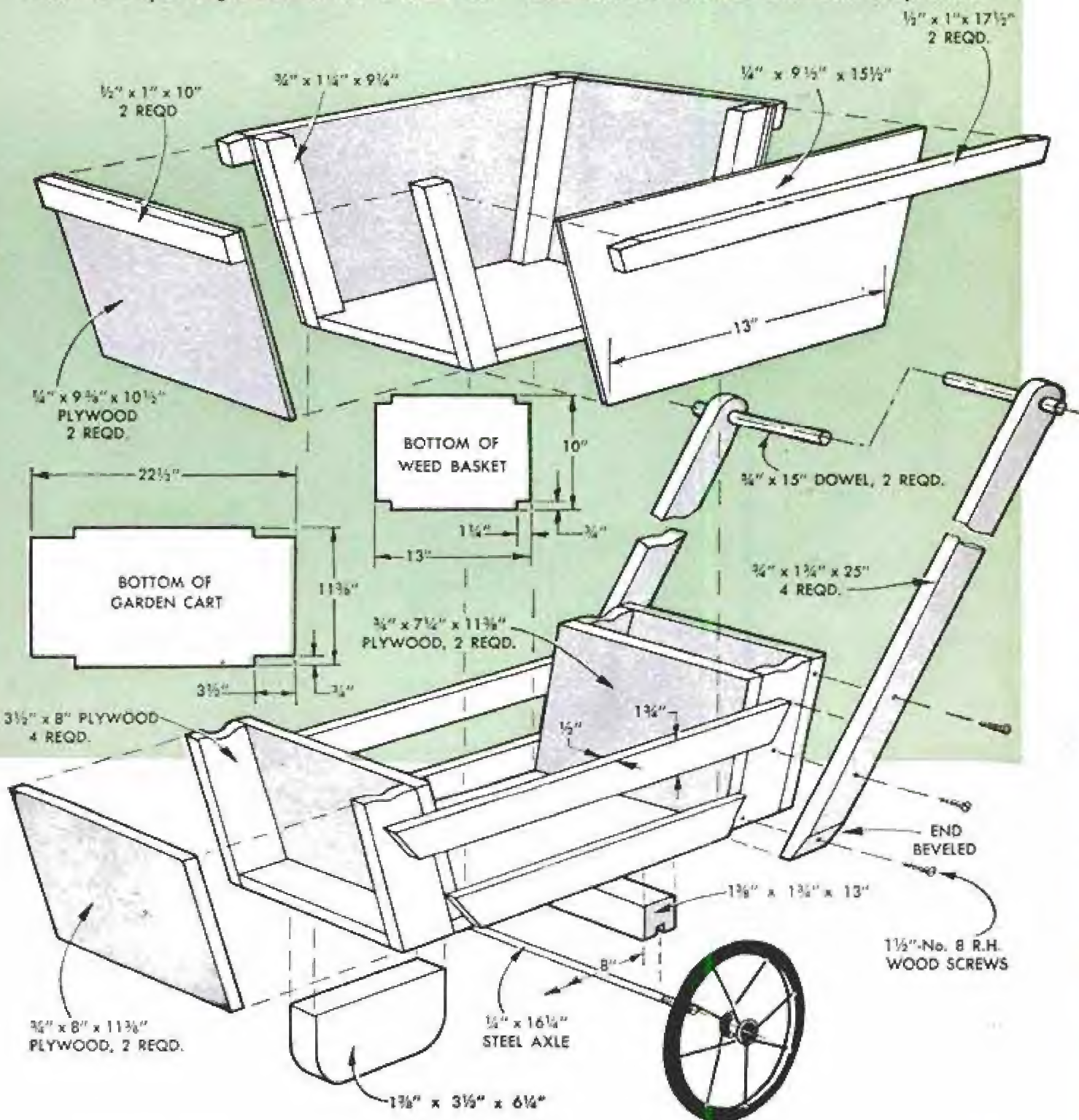


Completed cart is given coat of sealer and several coats of house paint



Only two sides of removable basket slant outward, others are kept straight. The bottom is $\frac{3}{4}$ in. thick

Grooved axle block is located off-center, being screwed to the bottom 8 in. from end compartment



Friendly Giraffe Is Decorative Height Chart for Child



Both an attractive decoration for a child's room, as well as a useful height chart is this story-book giraffe cut from plywood, hardboard, wallboard or sheet linoleum. To make the giraffe, first cut a paper pattern slightly more than 4 ft. high, then trace it on the material to be used and saw or cut it out. Paint irregularly shaped "spots" on the giraffe, or cut them from the same material as the body and cement them on as overlays. Paint the giraffe body yellow, the spots a terra-cotta color. Cement the finished animal to the wall, then mark off feet and inch measurements to one side of the neck and paint one large, friendly eye in the head.

Short Cut in Chair Repairing

Dried glue remaining in a hole in which a chair leg or rung is to be replaced must be removed to assure a correct fit. A quick way of doing this is to wrap sandpaper around a dowel that is slightly smaller in diameter than the hole. Chuck the dowel in a drill press, or hand brace, and rotate it in the hole. This will quickly remove dried bits of glue.

Complete Engine Tune-Up Requires Mechanical-Tappet Adjustment

Adjustment of mechanical tappets often is overlooked during an otherwise complete engine tune-up job. Tappets that are quiet are not necessarily in proper adjustment.

Replacement of lifters, or grinding the faces of rocker arms, often is necessary to assure that quiet tappets also have the proper clearance for maximum efficiency.

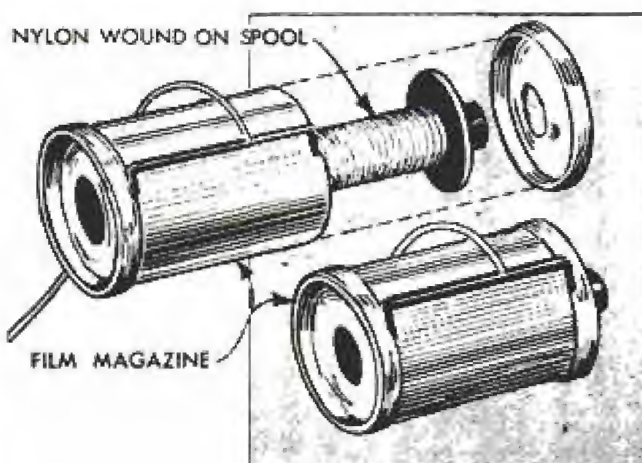
Identifying Filter Containers

For quick identification of a number of photographic filters, write or type the daylight and tungsten exposure guide numbers along with the filter type on a piece of paper and attach it to the cover of the filter container. If it is available, colored paper of a shade to match the filter color should be used for the identification label, to make selection even quicker and simpler.

Don Honick, Chicago.

Leader Stored in Film Magazine

All the nylon or monofilament line needed by the average fisherman for making leaders can be stored neatly in his fishing kit by using a discarded 35-mm. film magazine, or cartridge. Remove the end cap from the cylinder, and take out the spool. Wind the line on the spool, then replace it, allowing an inch or two to project through the slit in the cartridge. Keep magazine in small can provided for it.

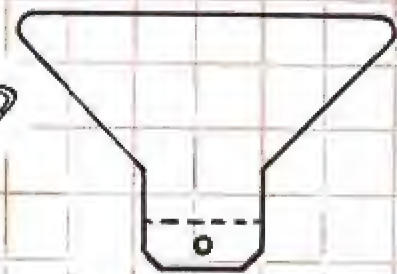


SNACK TRAYS

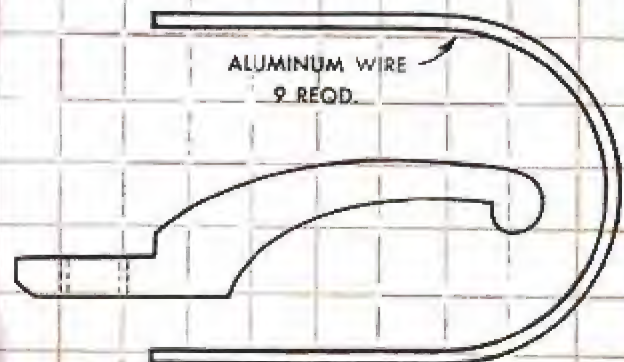
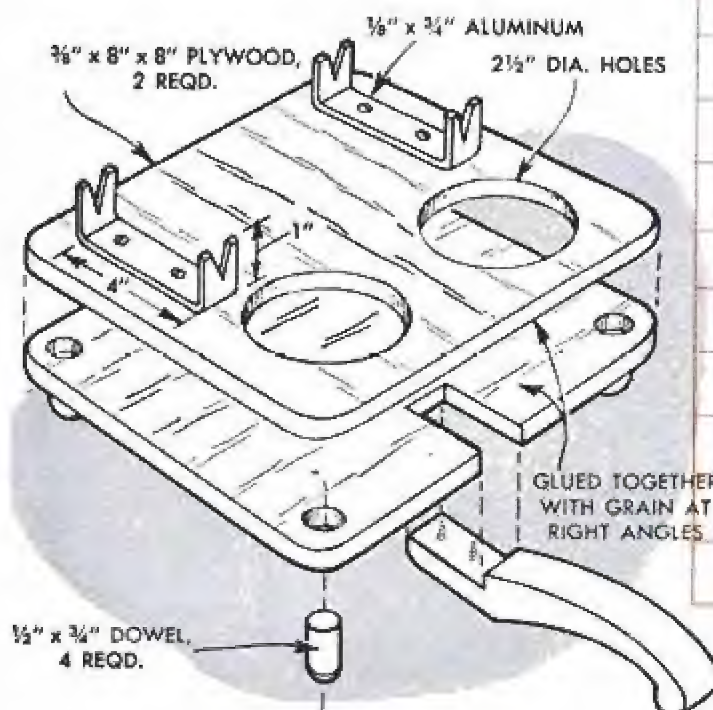


By **Bertram Brownold**

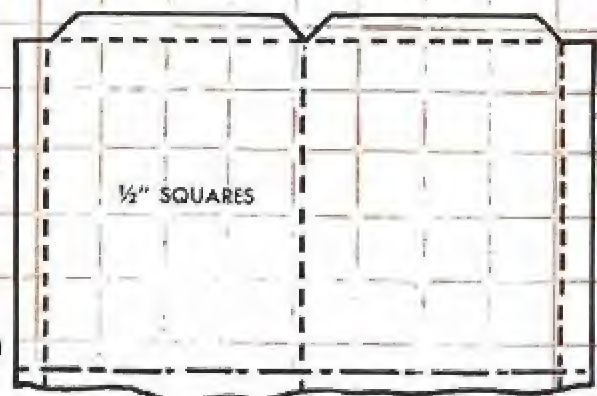
AS EASILY CARRIED by their handles as frying pans, these two snack trays are as simple to make as they are convenient to use. Both trays are identical except for the installation of aluminum-wire loops on one for holding toast, and a V-bottomed trough for cookies and crackers on the other. Custard cups are used for jellies and cheese spreads. Sheet aluminum is bent to form the cookie trough, aluminum flat bar is used for the knife holders. Rubber-headed tacks can be fitted to the dowel legs.



$\frac{1}{16}$ " ALUMINUM, 2' REQD.



ALUMINUM WIRE
9' REQD.



$\frac{1}{2}$ " SQUARES

Ornamental Wagon Wheels From

By Enno R. Haan

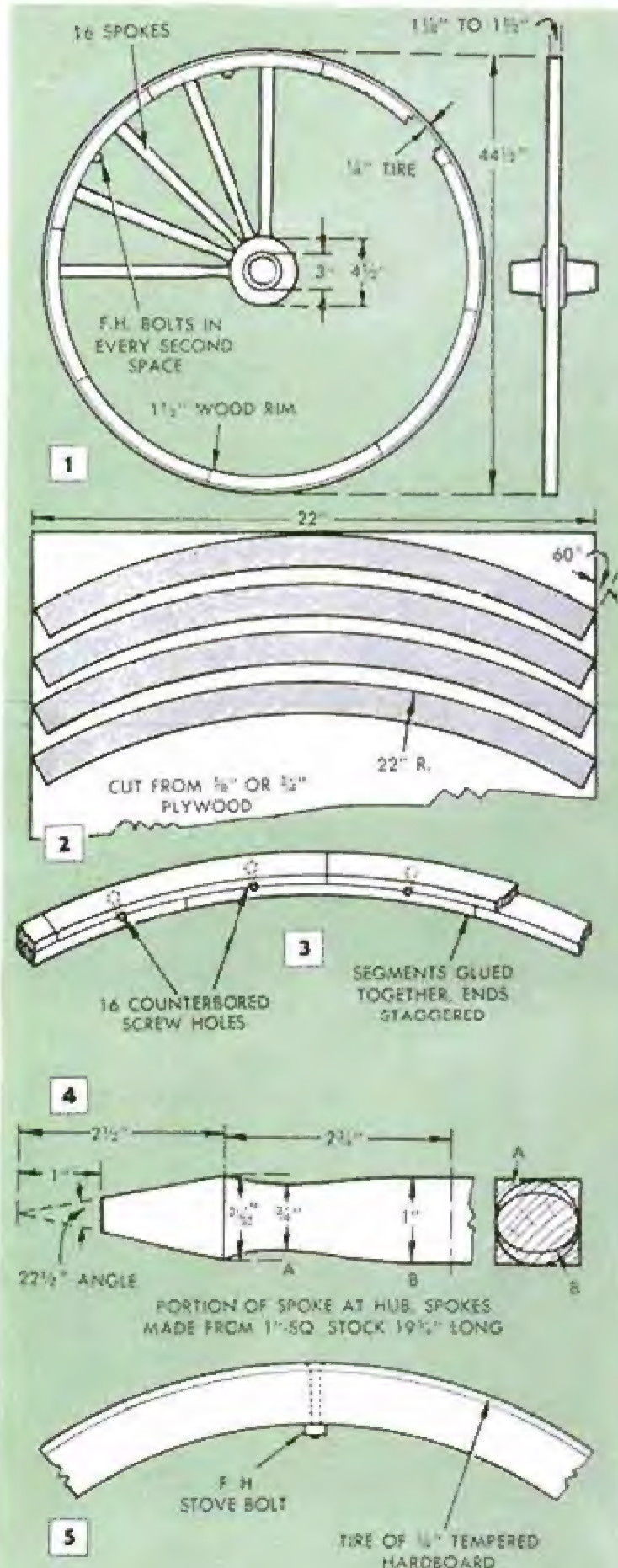
IF YOU HAVE FOUND it impossible to locate carriage or wagon wheels, such as shown in the photos, for use as gates or other decorations, you can use your workshop to solve the problem. Figs. 1 through 6 show an imitation wheel that resembles its prototype in considerable detail, while Figs. 7 and 8, plus detail A in Fig. 9, show a simplified version of such a copy. Moisture-resistant woods, such as red cedar, redwood and cypress are recommended for construction of the wheels, and should be painted to conceal the wood grain and joints.

For either type of wheel, start with the rim, or felly. This consists of band-sawed segments of solid stock or waterproof plywood, assembled with nails and waterproof glue. The plans show a rim size of 44-in. o.d., but smaller wheels can be made by reducing dimensions to suit. Figs. 2 and 3 show segments and method of assembly for the more realistic wheel; Figs. 7 and 8 show the segments and assembly method for the simpler wheel. To assemble the rims accurately, line them up on a circle drawn on a large piece of paper.

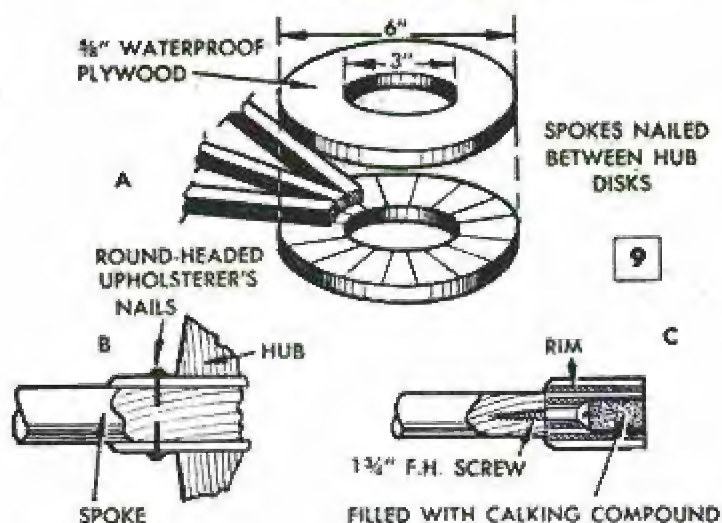
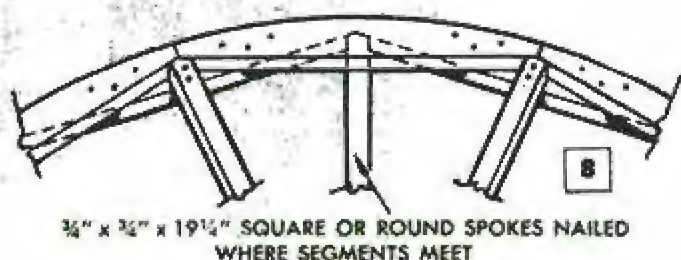
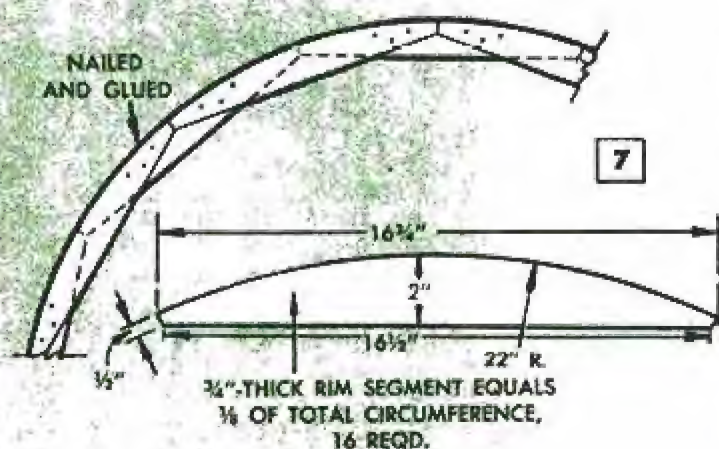
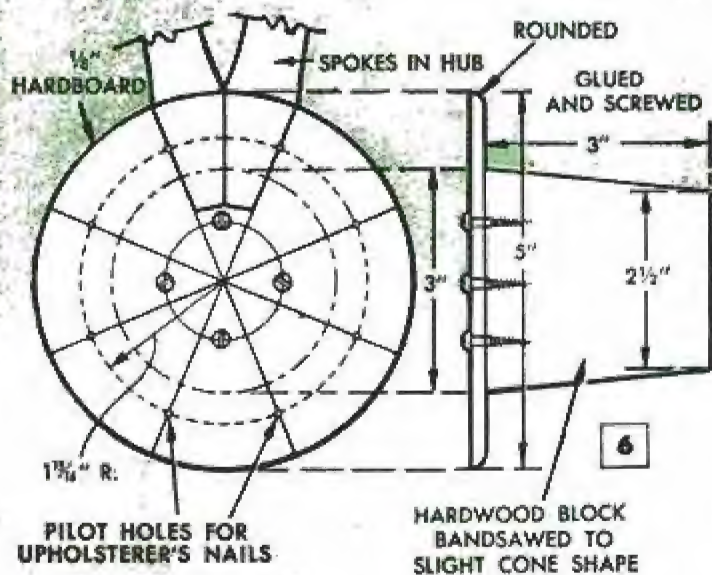
For the more authentic wheel, drill and counterbore screw holes radially in the finished rim, detail C, Fig. 9, for fastening the spokes. These are cut from 1-in.-sq. stock. Saw the hub ends to shape, Fig. 4, then round the rest of each spoke. The narrow neck of each spoke near the hub flange has an egg-shaped cross section, Fig. 4. Cut two hub blocks and two hub flanges, Fig. 6, and drill pilot holes in the flanges to receive upholsterer's roundheaded nails to imitate rivetheads, detail B, Fig. 9. Now, attach the hub blocks to the flanges.

Temporarily assemble all the spokes on a 5-in. circle to check for fit, and trim as necessary. Assemble and clamp the spokes, using waterproof glue on the inside of one hub flange. When the glue has set, glue on the other flange. Next, fit the hub-and-spoke assembly in the rim, driving screws into the spoke ends. Add a rim of $\frac{1}{4}$ -in. tempered hardboard, smooth side out, Fig. 5, after soaking the hardboard for bending.

The simplified version of the wheel has the spokes, round or square, nailed to the sides of the rim, Fig. 8. The hub ends are nailed and glued between two disks of $\frac{1}{2}$ -in. waterproof plywood. ★★



Your Workshop



Copies of wagon and carriage wheels made in your workshop can be used for ornamental purposes, as are real wheels shown above and below



Valve Permits Draining Sink Trap to Prevent Freezing



To simplify the job of draining the trap of a sink located in a summer cottage when this is necessary to prevent freezing during cold weather, fit a pet-cock in the trap as indicated. If there is a drain plug in the trap, the valve can be installed in its place. When there is no plug, the trap can be drilled and tapped to receive the valve. The valve will have to be soldered or brazed in place if the trap is of a material too thin to be threaded.

Handle Stored Inside Car Jack

Stored in the hollow column of a bumper jack, the jack handle is readily available and requires almost no space in the trunk. To prevent the handle rattling, cement a rubber block inside the jack.



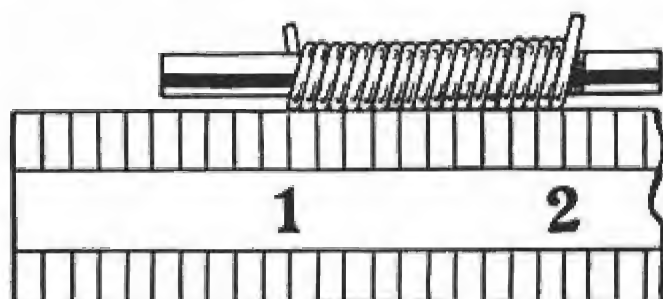
Improved System Sterilizes and Filters Furnace Air

Changes in the filtering system of his forced-air furnace were used by one homeowner to alleviate hay fever and asthma suffered by members of his family. Filters in the furnace were replaced by an electrostatic type manufactured by the Goodyear Tire and Rubber Co. under the trade name Plotron. The filters consist of matted polyethylene plastic fibers held in an aluminum frame by pieces of hardware cloth. When an air current passes through the filters, an electrostatic charge is generated.

Dust particles are attracted by the charge and held in the plastic. The filters are cleaned by rinsing in water, or, if especially dirty, in mild soap and water. Washing does not affect the electrostatic characteristic of the plastic. To further purify the air circulated by the furnace, the homeowner installed a germicidal light in the furnace plenum. Similar to a fluorescent lamp in appearance, and also requiring a starter and ballast, the 30-watt lamp produces ultraviolet rays.

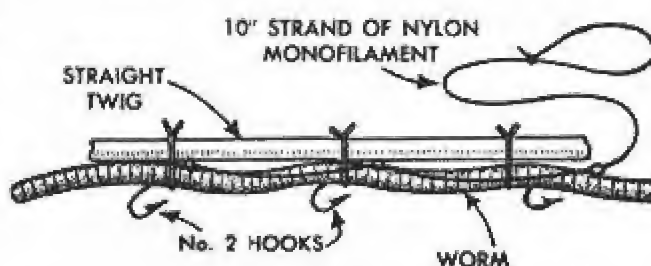
Measuring Diameter of Wire

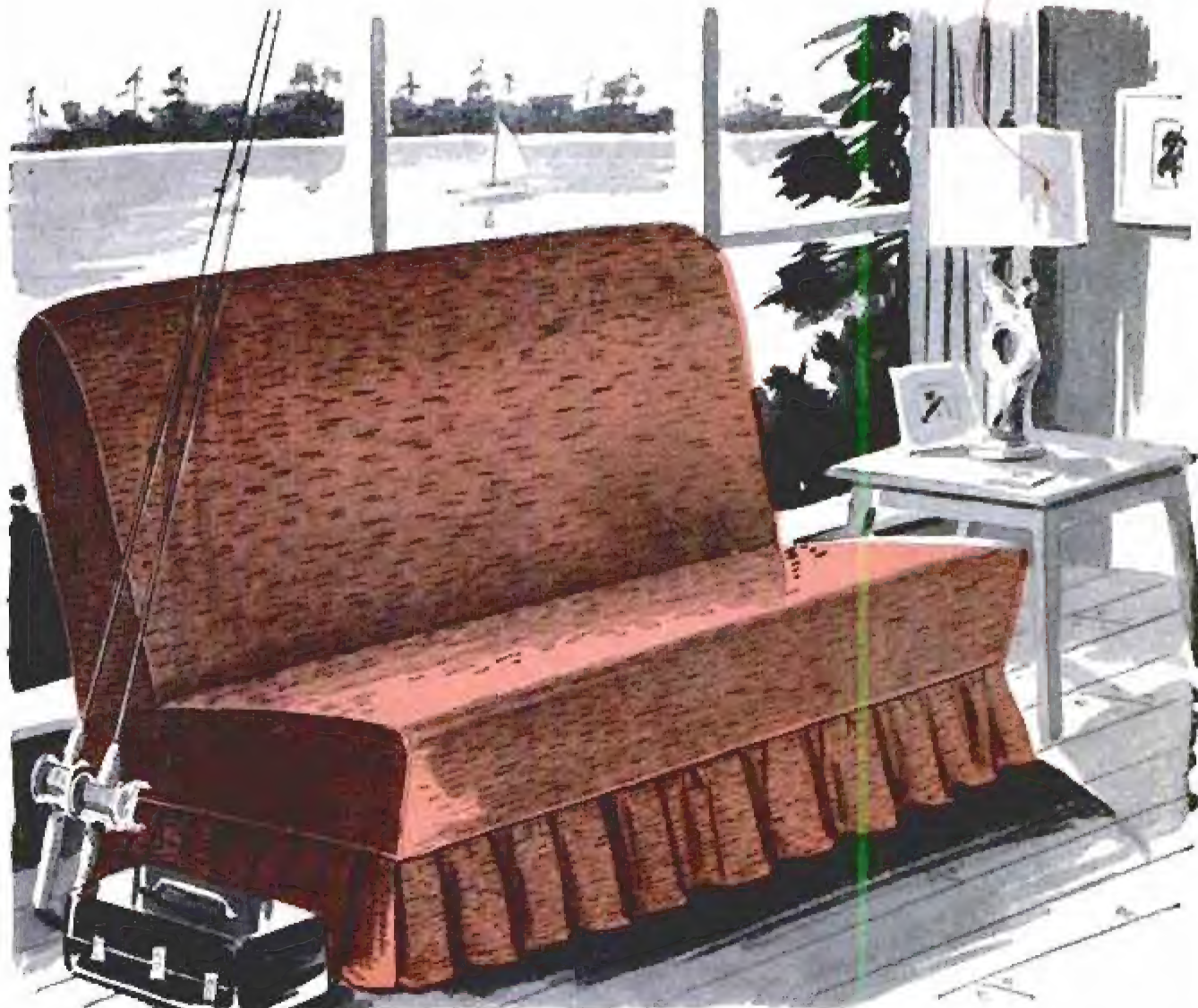
One method of measuring the size of small-diameter wire, when no micrometer is available, is to wind it on a dowel to form a helix. Wrap the coils tightly so there is no space between adjacent turns. Then, count the number of turns per in. and divide this number into 1 in. Thus, if there are 16 turns per in., 16 divided into 1 equals $\frac{1}{16}$ in., or 0.0625 in.



Worm Used as Surface Bait

Used as surface bait, a night crawler will catch more fish than when it is used deep in the water. Lash the worm to a straight twig with nylon thread, then insert three No. 2 fly hooks through the body of the worm so the shanks are hidden. Run a 10-in. leader through the eyes of the three hooks and tie it to your casting line. Weighing about $\frac{1}{4}$ oz., this "fly" will cast easily and float on the water.





Cottage "Settee" Made From Old Car Seat

HERE IS AN attractive and comfortable "settee" that is ideal for use in a recreation room or lake cottage. You can have one like it simply by screwing two lengths of 2 x 4 lumber to the underside of a front auto seat as shown in the lower-right photo. The 2 x 4s serve as a base to which a wooden block is screwed at each corner for

proper elevation of the seat. For a higher seat, add one or more blocks cut from stock of the desired thickness to each foot. The washable slip cover is made from several yards of inexpensive cotton material having a pattern that is suitable for the room in which the settee is used.

Edward W. Bird, Bethesda, Md.

After vacuuming cushions upholstery is cleaned with foam from detergent mixed with 2 qt. warm water

Seat base consists of two 2 x 4s, with wooden blocks for legs attached at ends, screwed to seat bottom



First Aid for Furniture Legs

By Walter E. Burton



Pencil clamped to length of wood scrap is handy gauge for marking chair legs for uniform cutting

UNSIGHTLY SCRATCHES or other damage to the legs of your favorite chair or table needn't be the cause for discarding the piece, or paying a small fortune for refinishing it. To restore the original beauty of the damaged piece simply follow the repair suggestions illustrated in this article. Even broken legs can be made to appear like new by anyone familiar with common tools as indicated in Fig. 5.

Surface scratches can be made less noticeable by applying furniture wax or scratch remover. Another way of concealing scratches is to rub boiled linseed oil on the damaged finish with the fingers. Then,

After sanding damaged finish on furniture leg, varnish of matching color is applied with artist's paintbrush to blend touched-up areas with old finish



rub the area with a turpentine-dampened cloth and polish it with a dry cloth. To darken and refinish worn areas that appear bleached, sand the areas, and apply varnish stain to match the finish, Fig. 2. Dark spots on blond-finished wood may be lightened with dry-cleaning fluid rubbed on with a cloth. If this doesn't do the job, try rubbing the spots with tooth powder mixed with water to make a paste. After removing the abrasive material, the wood is waxed or varnished as necessary.

For accurate trimming of uneven chair legs, clamp a pencil to a length of wood and mark the legs as in Fig. 1. Then, trim each leg with a rasp. Most chairs have front legs that are of a different length than the rear ones and must be trimmed proportionately. An easy remedy for leveling uneven table legs is to place caster cups under each leg with cardboard disks inserted in each cup that requires shims, as shown in Fig. 3.

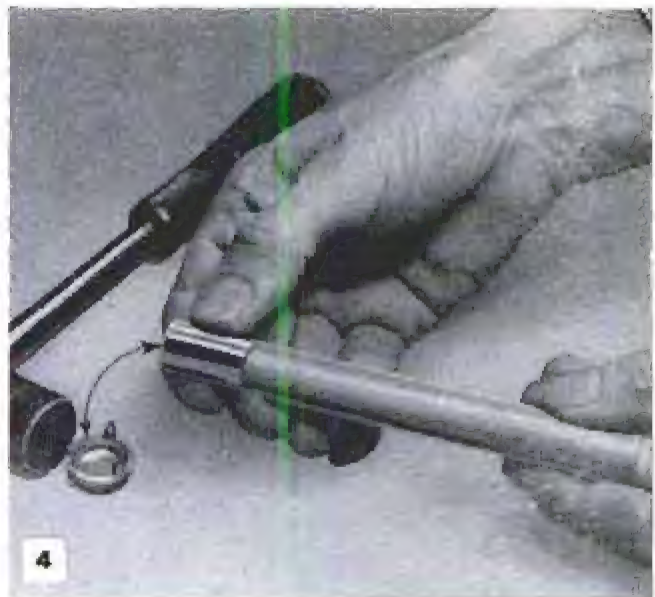
A good way of protecting legs from scratching is to install metal ferrules on each leg as in Fig. 4. The ferrules are cut from metal tubing of the desired diameter and then are driven onto the legs with a mallet. A furniture glider tapped on the end of each leg protects the floor.

Casters that drop from chair legs are repaired by replacing the worn sleeves, Figs. 7 and 8. To prevent a leg from splitting when driving in a new sleeve, the hole is enlarged and a length of copper tubing inserted to receive the sleeve. ★ ★ ★



Disks cut from sheet of heavy cardboard are placed in caster cup to provide inconspicuous shim for furniture leg that is slightly shorter than others

To repair broken chair leg saw off damaged part and join extension piece to leg with dowel. Folded sandpaper on dowel aids dressing surfaces of joint

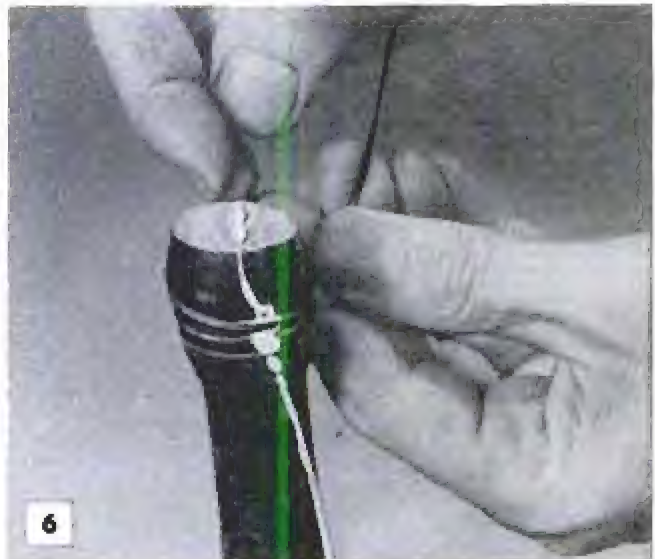


Ferrule for small furniture leg is cut from length of brass tubing and driven on leg. Furniture glider installed on end of leg protects floor from damage

Cracked chair leg is repaired by applying glue to contacting surfaces of break and wrapping strong rubber band around leg to clamp pieces securely

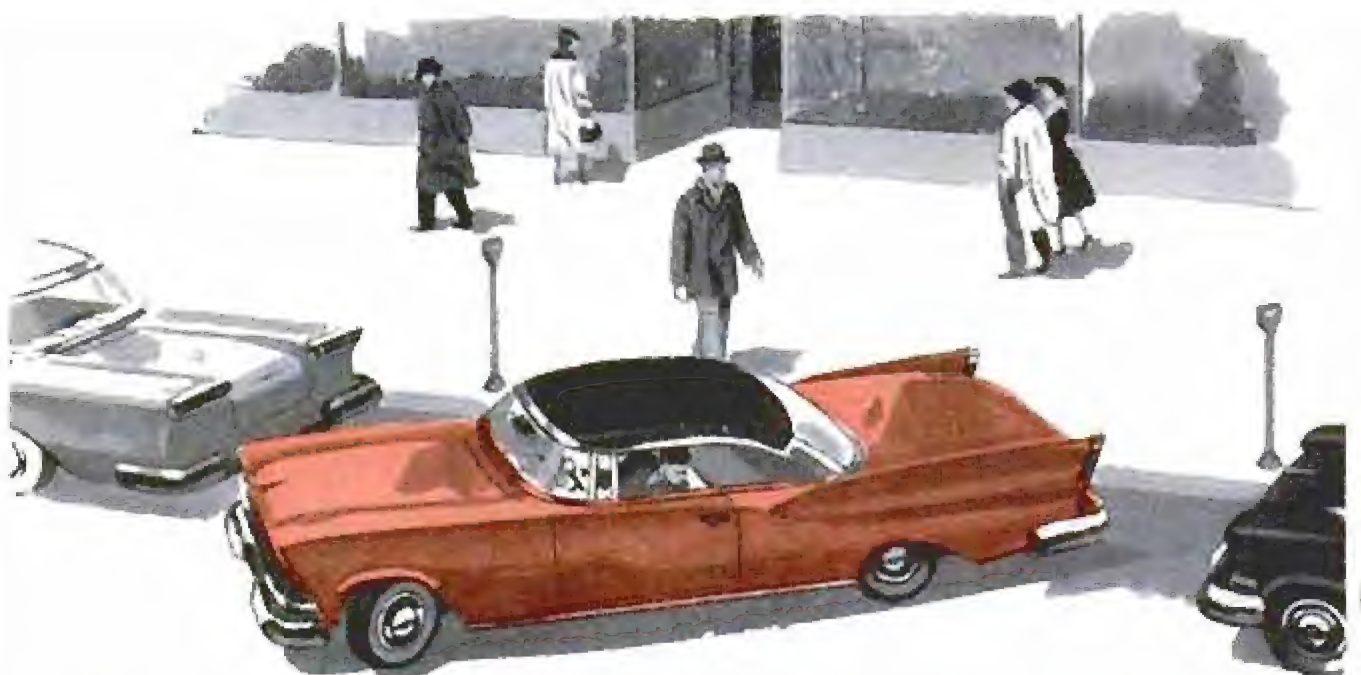


To prevent caster from falling out of socket, worn sleeve is replaced by new one. Length of copper tubing inserted in hole prevents leg from splitting



When installing caster in socket, center punch should be used for driving stem into sleeve. Striking caster wheel with hammer might damage the wheel





Do's and Don'ts of Power-Steering Repairs

By John Krill

SN
59

BECAUSE IT WORKS silently and unseen, power steering on a modern automobile is taken for granted until the day it suddenly takes extra effort to turn the steering wheel, and parking becomes a muscle-straining job. Like all things mechanical, power steering sometimes malfunctions. When this happens, there are a number of simple tests that the average car owner can make to determine how serious the trouble is, and whether or not he can fix it himself. The unit illustrated in this article, Figs. 1 through 5, is the power-steering assembly on a 1955 Chevrolet. While other makes of power steering differ somewhat, an understanding of this particular unit will provide a general understanding of all types.

Basically, a power-steering unit consists of a hydraulic pump to provide pressure, detail 1, Fig. 3, lines to deliver the fluid under pressure to a cylinder, detail 2, Fig. 3, and a valve, detail 3, Fig. 3 and detail 4, Fig. 2. The valve is operated by the pitman arm, Fig. 2, to route the fluid to the correct end of the cylinder. A piston inside the cylinder then moves the steering assembly to match the movement of the steering wheel. The hydraulic pump on the Chevrolet is driven by a splined extension of the generator shaft, Fig. 5, which means that if the fan belt is loose or worn, and the generator does not rotate properly, neither will the pump. Belt adjustments are made by pivoting the generator on its brackets, Fig. 1. Other types of power

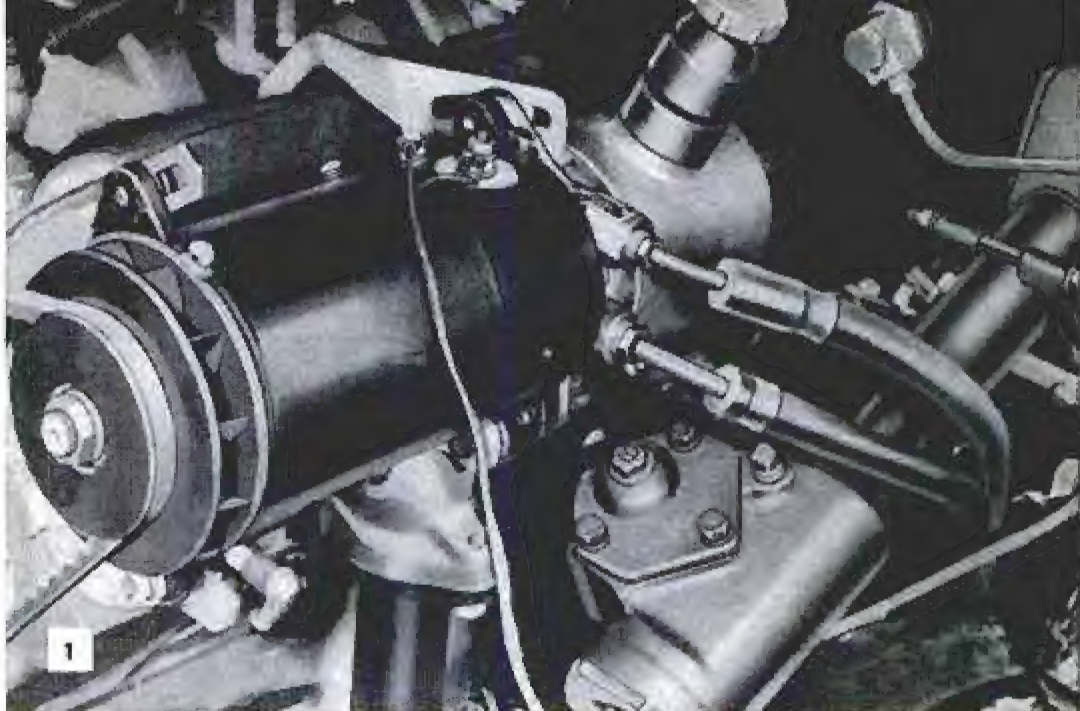
steering have pumps driven directly by the fan by means of a pulley on the pump shaft. The first test to make is to determine whether the fan belt is adjusted to the right tension, or if it is worn and needs replacing. Adjusting or replacing a fan belt are easy jobs for the home mechanic and require only simple tools.

If the fan belt is all right, and the power steering still is inoperative, the next thing to check is the oil level in the pump reservoir. To illustrate the importance of the reservoir being full, pump pressure in the Chevrolet unit is 750 lb. per sq. in. Other units may have varying pressures, but all will be relatively high and any loss of fluid seriously reduces the efficiency of the unit. Hydraulic oil may be lost by leakage through connections in the hydraulic lines and hoses, or through a damaged oil seal in the pump itself. When checking the oil level in the pump reservoir, inspect the oil closely to see if any air bubbles are present. Bubbles mean that air is trapped in the hydraulic system, and the system must be bled to remove it. Bleeding the air is another operation the home mechanic can do himself. First, after wiping all lines and hoses clean, make sure the pump reservoir is full. If oil must be added, allow a few minutes before going to the next step in the operation. Now, jack up the car so that both front wheels are off the ground. Start the engine, let it idle for a few minutes, then accelerate it to about 1500 r.p.m., which is equivalent to about 35 m.p.h. with

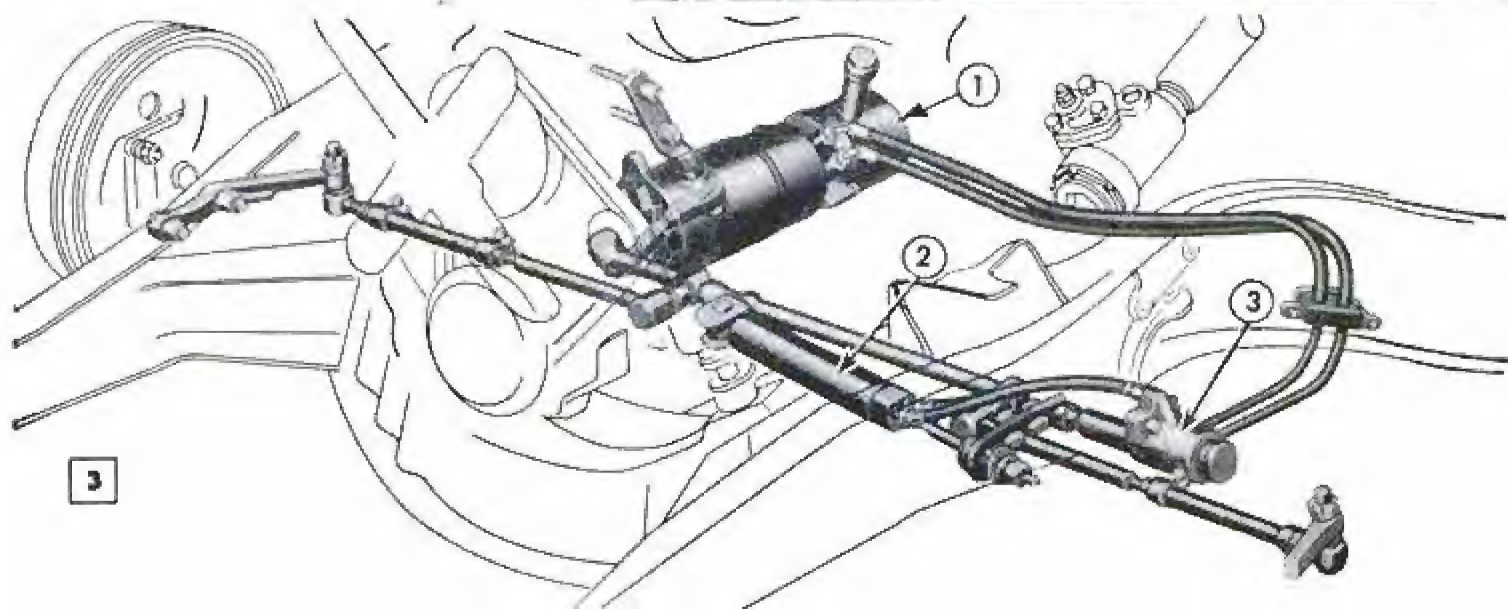
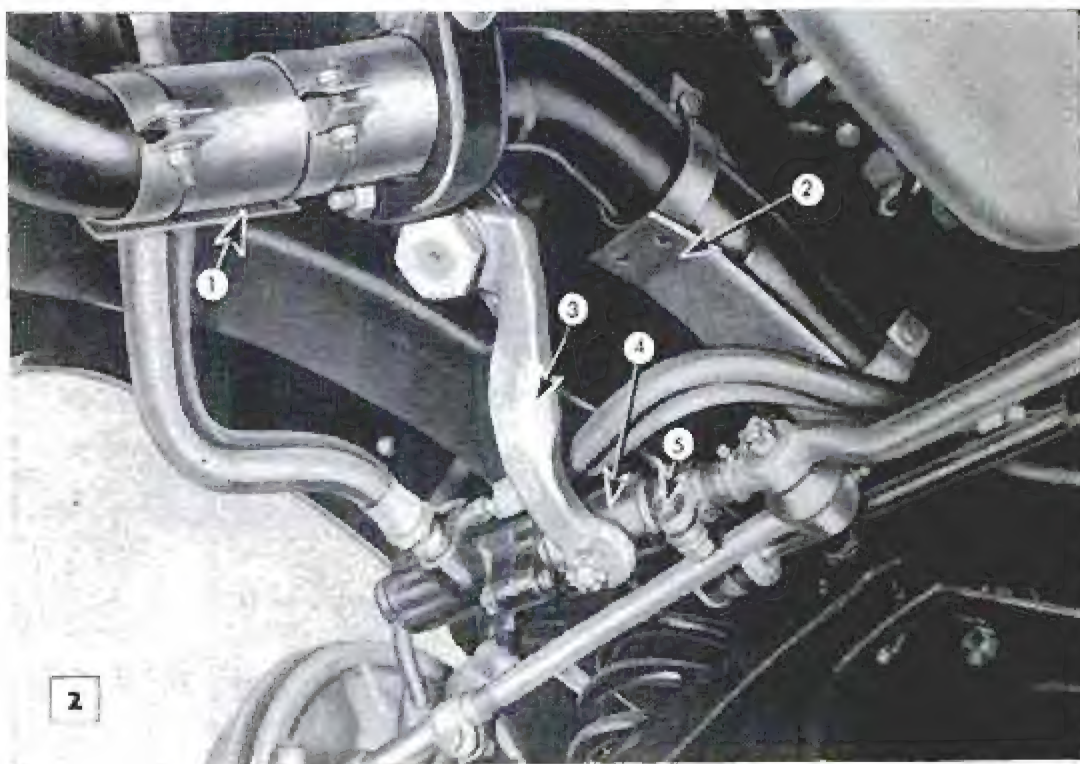
the transmission in neutral and the rear wheels blocked. Slowly turn the steering wheel all the way left, then all the way right. Lower the car and remove the jack. Turn the steering wheel from full right to full left with the wheels on the ground. Inspect the cleaned lines and hoses for any leaks, then recheck the pump and add oil if necessary.

Make sure the pump assembly is bolted solidly to the back of the generator. (This refers to the Chevrolet unit. On others make sure the brackets and pump are bolted solidly together.) Be sure there are no worn bearings in either the pump or generator. Damaged bearings will cause noisy operation and possibly sluggish operation if the bearings are binding on the pump or generator shaft and causing the fan belt to slip.

If the steering still is not right after these checks, take your car to a competent mechanic. Unless you are a skilled mechanic, it is not recommended that you tear down and rebuild a power-steering hydraulic pump. If the pump is malfunctioning, remove it and have a mechanic rebuild it for you. You can save the labor costs involved in removing and replacing the pump, and be sure that the pump has



Above, power-steering hydraulic pump in place behind generator on 1955 Chevrolet. Below, Fig. 2, details 1 and 2 are heat shields, detail 3 is the pitman arm, 4 is the valve, and 5 is the adjustment clamp. Below, Fig. 3, detail 1 is pump, detail 2 is cylinder, detail 3 is the valve





Hydraulic pump for power steering on 1955 Chevrolet is bolted to back of generator housing, unit is driven through generator by fan belt

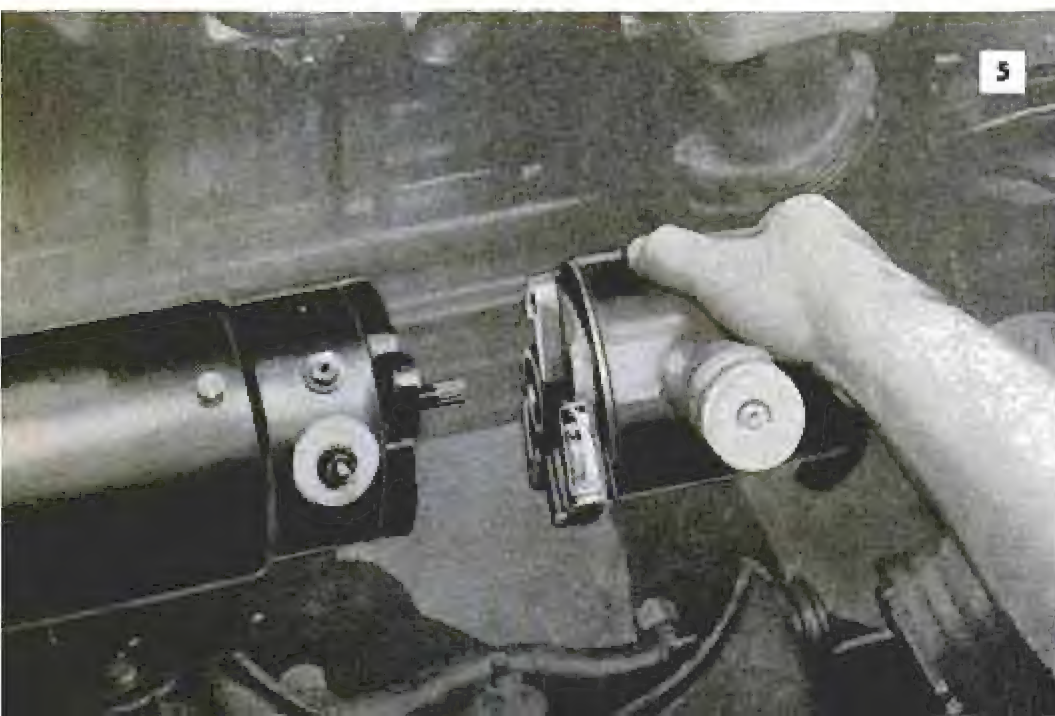
been serviced properly. After you have replaced the pump, bleed the system in the manner already described.

Generally, the first test a mechanic will make on a complaint of power-steering trouble is to hook a special scale to the steering wheel and apply pressure to determine how much effort is required to turn the wheel. If the pressure is greater than specified by the manufacturer, the mechanic will know that something is wrong and can make further tests. If there is a buzzing sound in the power-steering system, it means that a valve is sticking. The mechanic will disconnect one of the oil lines and hook up a pressure gauge. With the gauge in place, the steering wheel will be rotated from right to full left, with the engine idling. The gauge then will show whether the pump is producing too high, or too low a pressure. Depending on

column, and changing the "lash" or free play in the steering gears. A mechanic can quickly tell if the steering gears are in proper adjustment.

If you are a skilled mechanic, tearing down and rebuilding the hydraulic pump for a power-steering unit is not too difficult. But, the unit must be assembled on a clean workbench, and each component of the unit must be spotlessly clean. Even a small particle of grit in the hydraulic system can cause trouble by jamming a valve, cutting an oil seal or blocking an orifice. A solvent should be used to wash all parts, and they should be wiped dry with a lint-free cloth. Do not strike any parts with a steel tool. Any sharp edges or burrs on any component should be removed with a fine hone. When the reassembled pump has been installed, it will be necessary to bleed the hydraulic system of the power-

Power-steering pump positioned for installation, showing splined extension of generator shaft that fits into pump shaft and drives it



the gauge reading, the mechanic will make repairs to correct the pressure. He will, of course, bleed the system after the gauge has been removed and the lines reconnected. Front-wheel alignment also will be checked. Poor alignment will produce resistance in the steering that might seem to be a malfunction of the power steering.

In extreme cases, the steering-gear case at the lower end of the steering column might be causing resistance. Adjustments in the gear case permit reducing or increasing end play in the steering

column, and check all connections for leaks. Make sure that the heat shields on the exhaust pipe, details 1 and 2, Fig. 2, are in place. If the shields are removed, heat from the exhaust can cause the hydraulic oil to boil and affect the efficiency of the power steering. The boiling fluid will act much like air in the system, and bleeding the system will seem to correct the trouble. However, the moment the hydraulic oil again becomes heated by the exhaust, the trouble will return. The hydraulic lines must be kept cool. ★ ★ ★

On the MARKET

for Do-It-Yourselfers

1. POLKA-DOT PAINT comes in a pressurized container, can be used to decorate any painted surface. Size of dots is determined by distance container is held from surface; the farther away the smaller the dots. Dots of various colors can be applied without waiting for those previously applied to dry thoroughly

Sapolin Paints, Inc., 205 E. 42nd St., New York City 17

2. WEATHER STRIPPING combines a rigid and flexible plastic in a continuous strip which can be used in place of the conventional doorstop in new construction. Keeps out rain, snow, dust, draft and insects. Comes in sets to fit all standard interior and exterior doors, also for large openings up to 6 x 7 ft.

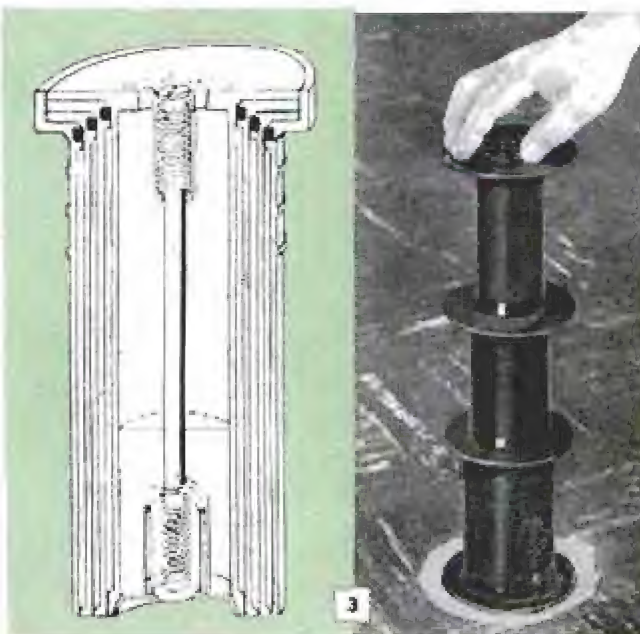
The Duraflex Co., 3500 N.W. 42nd St., Miami 42, Fla.

3. TELESCOPING STANDPIPE for basement drain prevents flooding of basement floor when water backs from the storm sewers. Fits inside 4-in. drainpipe or tile, extends to about 25 in. above floor under pressure of 2 lb. per sq. in. Pressure-relief valve opens at about 6 lb. to prevent damage to floor of basement

Sewer-O-Matic, Inc., 5926 S. Racine Ave., Chicago 36

4. DOUBLE-CHANNEL ALUMINUM TRACK for sliding panels or doors comes in sets in two sizes. The smaller provides channels for glass or hardboard panels $\frac{1}{8}$ in. thick. Larger set provides double-track channels $\frac{1}{4}$ in. wide for plywood or hardboard. Standard length is 6 ft. Each set contains two tracks

Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.





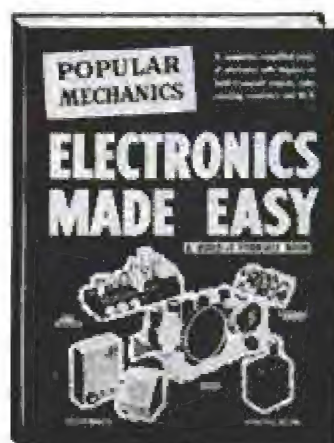
Paint Mixed With Coat Hanger

Here is an easy way of mixing paint that has settled to the bottom of its container. Simply form two legs in a heavy-wire coat hanger and cut off the hook as shown in the detail. Then, chuck the twisted portion of the hanger in a hand drill and use it to mix the paint as shown.



Improvised Bar Clamp

When gluing veneer strips to the edges of a plywood panel and bar clamps are unavailable for clamping the material, try using a C-clamp for this purpose as shown. Small wooden wedges forced between the clamp frame and veneer strip apply pressure as needed to secure a good bond.



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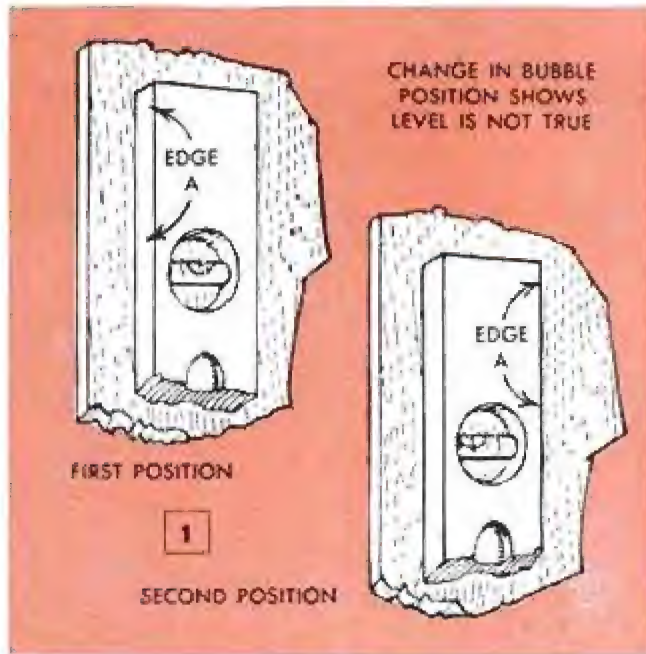
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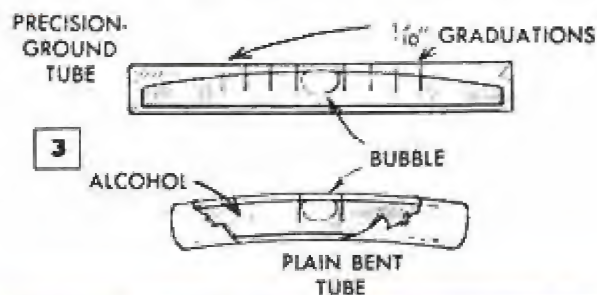


How to USE A LEVEL

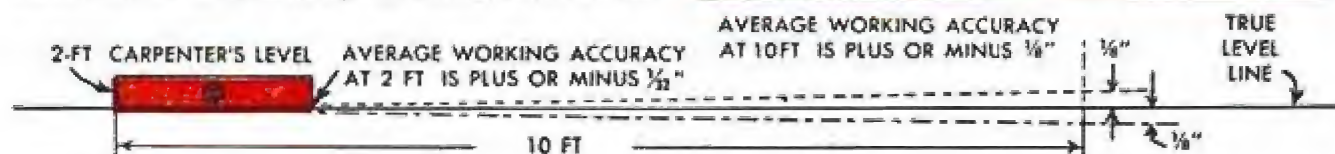
By Sam Brown

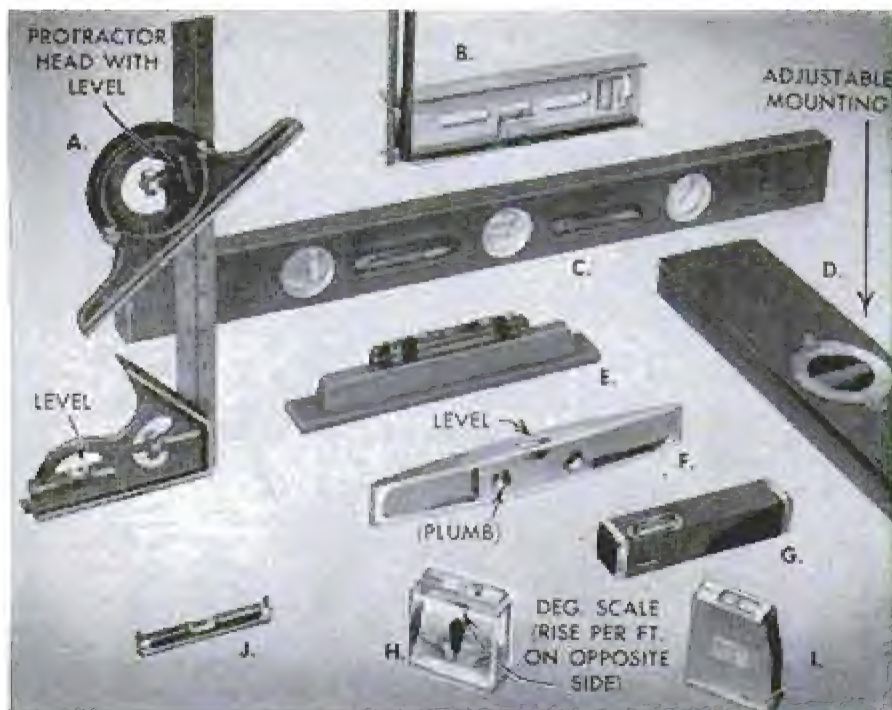
CORNERS AND WALLS of wood and masonry buildings stand straight and true because the builder used a level to plumb them at the time of construction. He very likely used a carpenter's or builder's level with fixed level tubes in a wooden frame, the simplest and probably the most useful of all the various types of levels. It's made with plain bent tubes, or vials, each containing alcohol, a bubble and two graduations, or witness marks, as in Fig. 3, the lower view. This type of level will show an error of about $\frac{1}{8}$ in. in 10 ft., Fig. 4, the lower detail. This is considered permissible in common building construction.

Precision-level tubes are ground inside to a true radius and are graduated to $\frac{1}{10}$ in. as in the upper view, Fig. 3. On the precision bench level each graduation can represent, for example, 10 sec. of arc, which is equal to .0006 over a span of 1 ft. Note the table, Fig. 4, which gives comparative values for various types of levels, Fig. 5. Extremely accurate, the precision level must be used correctly as otherwise much



4 LEVEL TUBES				
ANGLE PER GRADUATION OR 1/10" BUBBLE MOVEMENT	CHANGE FOR 1/10" BUBBLE MOVEMENT		AVERAGE WORKING ACCURACY	
	At 1 Ft.	At 60 Ft.	At 10 Ft.	At 100 Ft.
2 SEC. OF ARC	.0001"	.007"	.0001"	.001"
A 10 SEC.	.0006	.035	.001	.01
A 30 SEC.	.0017	.104	.002	1/4
1 MIN.	.003	.209	.003	1/2
5 MIN.	.017	1.04	1/4	1 1/2
25 MIN.	.087	5.23	1 1/4	7 1/2
B 1 DEG.	.209	12.5	3 1/4	19 1/2
A-PRECISION BENCH LEVEL B-CARPENTER'S LEVEL				





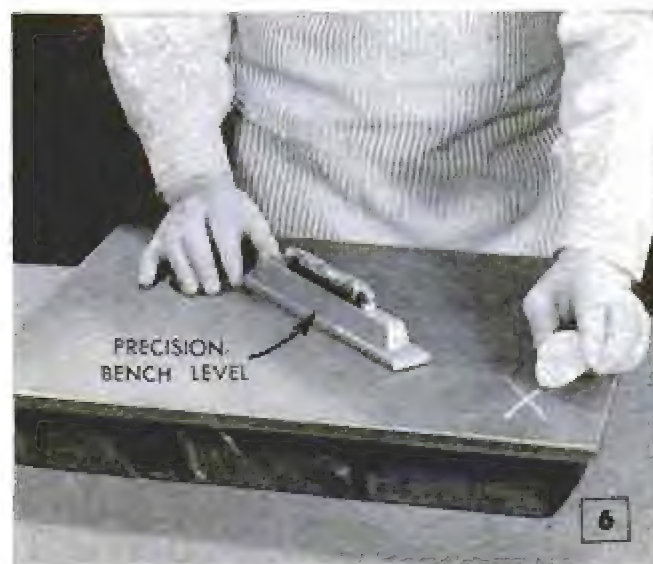
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- A. - COMBINATION SQUARE
- B. - LEVEL AND SQUARE
- C. - CARPENTER'S LEVEL
- D. - ADJUSTABLE LEVEL
- E. - PRECISION BENCH LEVEL
- F. - 9" POCKET LEVEL
- G. - HAND SIGHTING LEVEL
- H. - FLOATING PLUMB BOB
- I. - TAPE RULE WITH LEVEL
- J. - LINE LEVEL

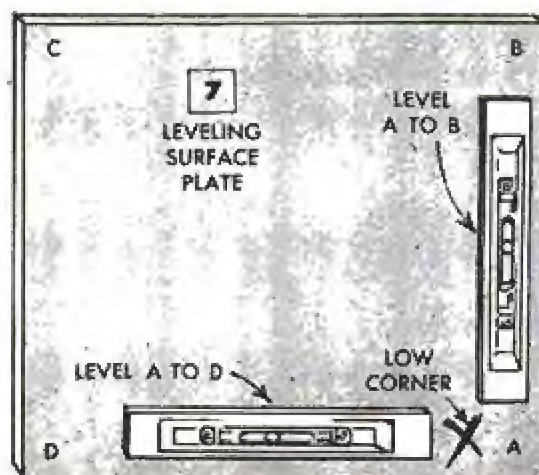
of the accuracy built into it will be lost. As an example, machinists, diemakers and others who use precision levels in the shop always allow at least 30 sec. for the bubble to settle, or stabilize, before taking a reading. Also, care must be taken to see that all contacting surfaces on both the level and the part, or parts, to be checked are perfectly clean. A film of oil, particles of dust or metal chips on any contacting surface will result in an inaccurate reading. Note the variations in average working accuracy of the levels A in the first column of the table, Fig. 4, and compare with B, the carpenter's level. Also note that a 25-min.-level tube has an allowable variation of $\frac{1}{16}$ in. at 10 ft. compared with $\frac{1}{8}$ in. for the carpenter's level. The 25-min. tube is used in some all-metal levels and also in those found on some combination squares.

Any level can be tested with reasonable accuracy simply by placing it on a flat surface, noting the exact position of the

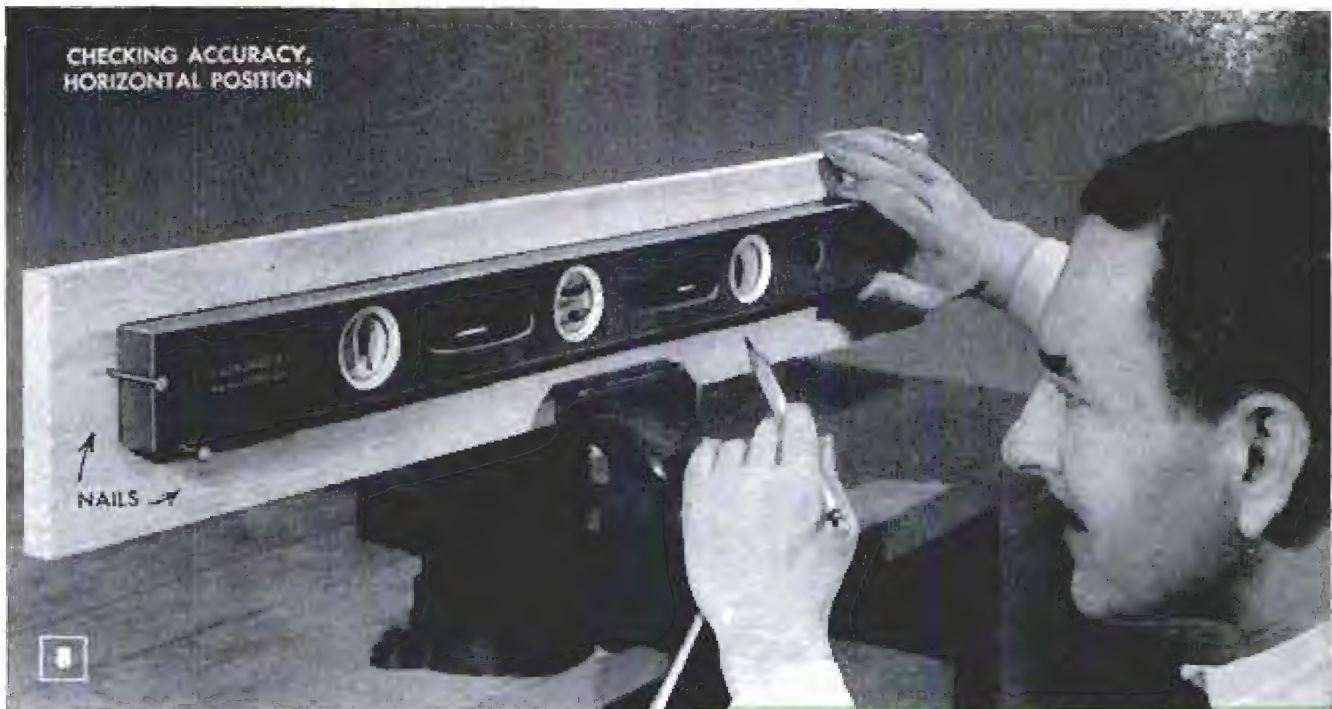
bubble and then reversing the level and comparing the bubble positions, Fig. 9, also Figs. 11 and 12. Of course, the positions of the bubble and tube have been exaggerated in the drawings for the sake of clarity. A somewhat more accurate test of a level can be carried out as in Figs. 2 and 8. The board used for both the vertical (plumb) and the horizontal test must be flat and smooth. For making the plumb test, Fig. 2, place the board in the bench vise as pictured and drive a small nail near the lower end. Place the end of the level against the nail, center the bubble in the plumb tube and make a light pencil mark on the board along the edge of the level frame. Then reverse the level side-to-side, Fig. 1, center the bubble and make a second pencil mark on the board. Then note the variation, if any, between the two marks. If the variation is not greater than average width of a pencil line then the level usually can be considered sufficiently accurate for prac-



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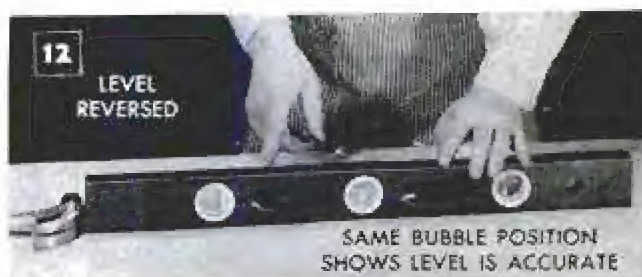
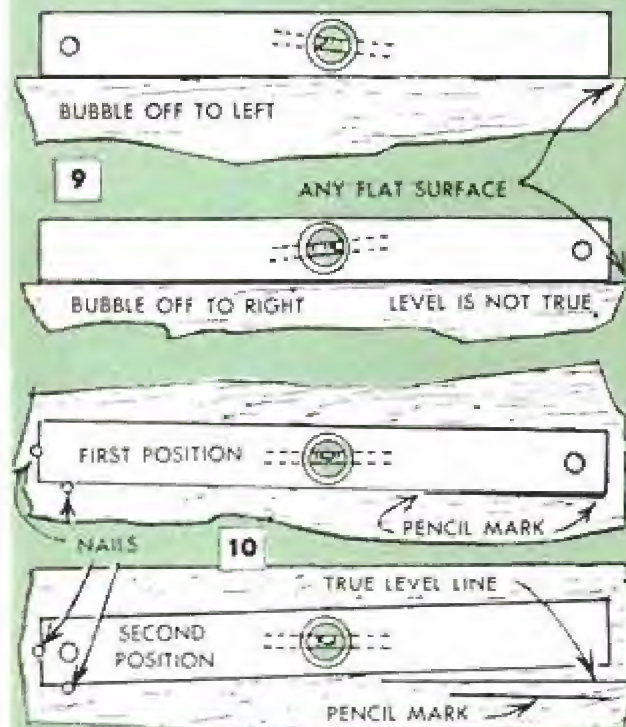


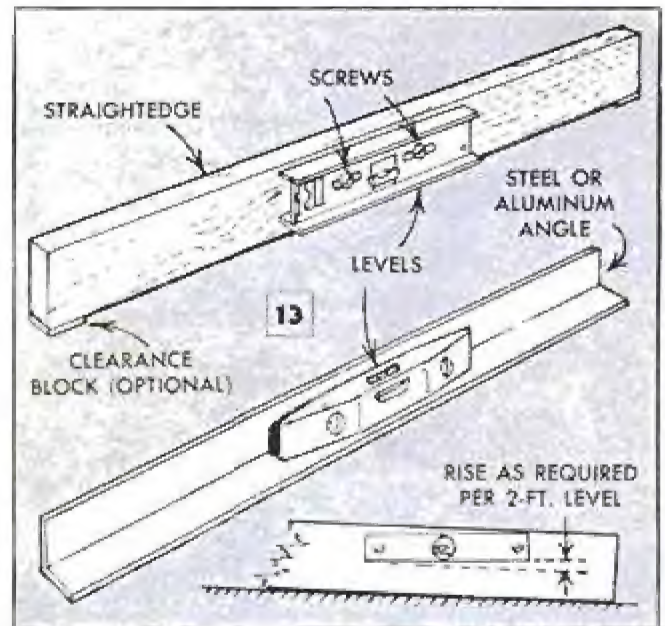
CHECKING ACCURACY,
HORIZONTAL POSITION



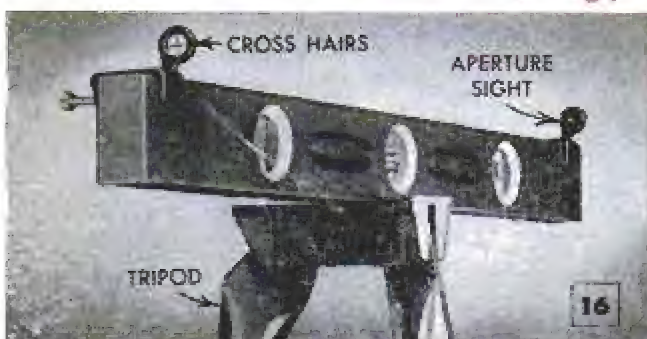
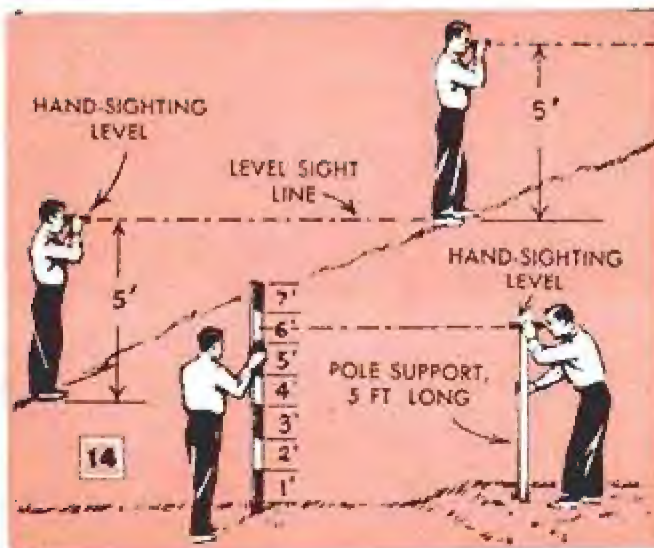
tical purposes. It should not, of course, be depended on for use on work requiring extreme accuracy. Proceed in much the same manner when making the horizontal test, using a board having two nails driven near the end to support one end of the level as in Figs. 8 and 10. When making both tests it's a good idea to repeat each test several times as there may be some slight error in reading the precise location of the bubbles in relation to the witness marks on the tubes. On nonadjustable levels having fixed tubes and wooden frames it may be possible to correct the error, if any, by planing the edges of the frame slightly. Levels having adjustable tube holders, or wells, can be adjusted to compensate for any error that may develop as a result of rough usage.

When using a level to check a horizontal surface keep in mind that the bubble moves toward the high side of the work, that is, it moves to the right or left in relation to the witness marks, or graduations, on the tube. When leveling a flat surface, such as a surface plate, Fig. 6, or a bench top or floor, first locate the low corner. A in Fig. 7. Then level the work to the two adjacent corners, B and D in Fig. 7. This is a general procedure for leveling comparatively large, flat surfaces, but when leveling a machine, such as a lathe, it is the usual practice to level first across the width and then check the length. For this work the precision level should always be used. Generally it is best to double check after leveling the machine two ways as the weight of the machine may cause it to settle on the blocking slightly. Also, make sure that the weight of the unit is evenly distributed on all bearing points, or pads, as otherwise inaccuracies may result.

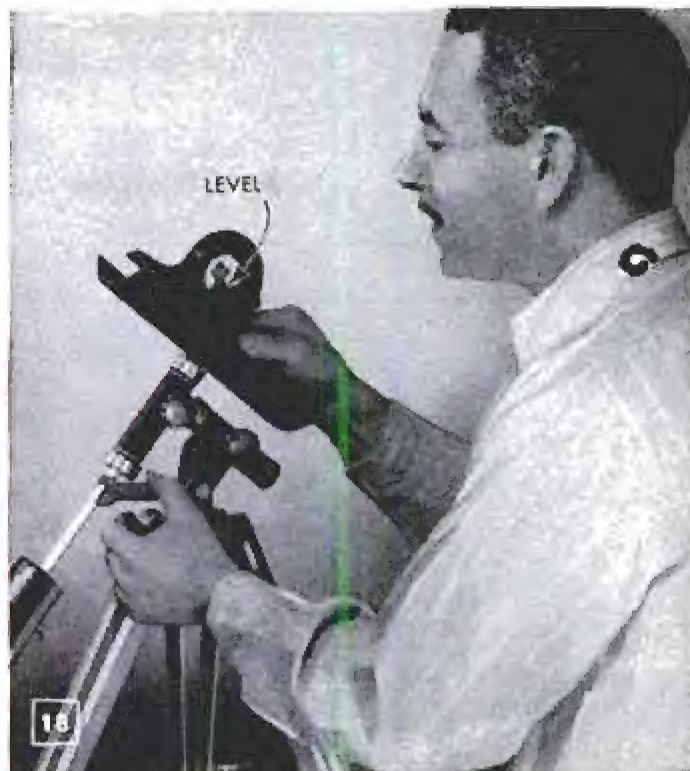
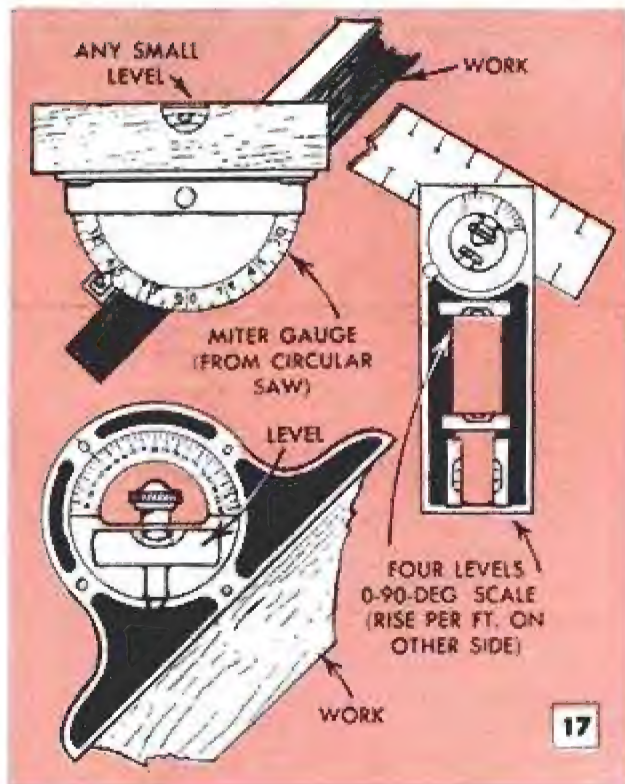




Long level frames do not necessarily add to the accuracy of the level as a unit but they do help to prevent errors resulting from poor contact. This is especially helpful in frame building construction, in laying up masonry and in setting the forms for poured concrete. Rather than use a long level, builders frequently attach a short level to a straightedge as in Fig. 13 and the photo at the left. In this way they gain the accuracy of the long level without sacrificing any of the advantages of the short level for other work. Note that clearance blocks are often nailed to the ends of the straightedge to eliminate any undue errors caused by contact with warped lumber. The level can be permanently attached to the straightedge with screws, Fig. 13, or can be placed on top of the straightedge as in the photo at the left of Fig. 13. Builders often use a level attached to a straightedge to obtain a uniform fall per ft. in a line of daintile. This is done by attaching the level to a straightedge as in the lower detail, Fig. 13.



An ordinary carpenter's level can be fitted with level sights, Fig. 16, and used to project level lines for a considerable distance. When used in this manner the unit usually is attached to a tripod or other rigid support so that it is at a convenient eye level. Another unit, probably more frequently used for this special work, is the hand-sighting level, Fig. 15. In this instrument a mirror reflects the position of the bubble to the observer's eye, making it comparatively easy to run level lines on grades and on level ground as in Fig. 14. For working a slope, or grade, as in the upper detail, Fig. 14, the instrument can be hand-held with an accuracy sufficient for most practical purposes. Where greater accuracy is required, the instrument should be supported on a pole or tripod and sight-



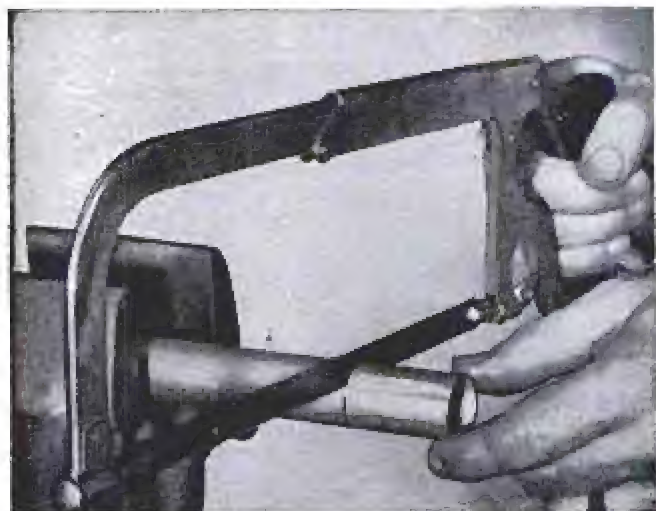
ed on a target as in the lower detail, Fig. 14.

An excellent tool, which employs four level tubes and is especially useful in checking angles in roof framing and other types of more precise work, is shown in the right-hand detail, Fig. 17. One side of the calibrated head is graduated 0 to 90 deg., while the opposite side shows rise per ft. A similar tool is the protractor head, lower left-hand detail in Fig. 17. This usually comes as an accessory to the com-

bination square, but for determining angles it is used without the blade, or scale. The built-in level provides a means of checking angles accurately, an example of its many unusual applications being shown in Fig. 18. Lacking these precise units, accurate angular checks can be made with the miter gauge from the circular saw used in combination with a small level, upper left-hand detail in Fig. 17. Very accurate work can be laid out with this simple setup. ★ ★ ★

Two-Way Cut Saves Blades

When a hacksaw blade breaks in a cut in thin-walled tubing, steel angle or a steel round, don't start the new blade in the old cut. Always turn the work over in the vise and run the new cut down to join the old one. The reason for this precaution is that the old blade is worn and cuts a narrower slot, or kerf. The new blade will bind and may break in the old cut.



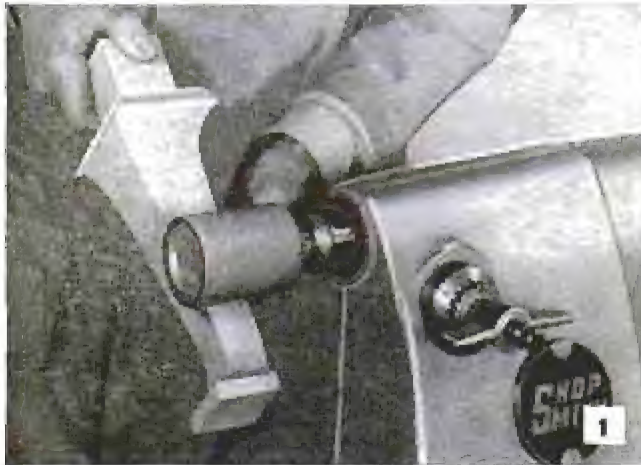
Improvised Speed Wrench

When there's no speeder handle in the socket-wrench set you can improvise a ratchet speeder in minutes or less from an ordinary bit brace. Just cut off the handle of the L-shaped driver, insert in the chuck of the brace as pictured and there you are. Or, place the short extension in the chuck. Most bit-brace chucks will take the smaller socket-wrench extensions.



How Would You Do It?

By Chris Nelson



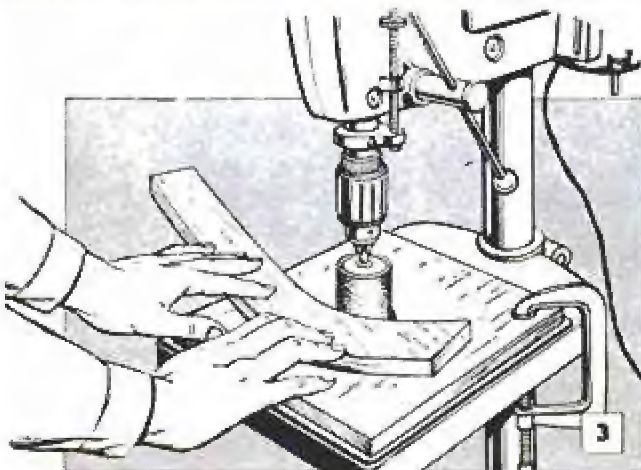
1. Q—What is meant by freehand sanding with a drum? Which part is moved, the work or sanding drum?

A—In freehand sanding the work is held in one or both hands and moved over the face of the rotating drum. Very accurate sanding of curved surfaces is possible when the drum is mounted on a horizontal spindle. It's best to use a medium-grade sandpaper



2. Q—Can a sanding drum be set up to do thickness sanding, working on the face of a board?

A—On a multipurpose machine like that pictured, turn a hardwood drum, attach a sheet of medium-grade sandpaper and locate the machine table under the drum. Feed the work against the rotation of the drum. Depth of cut should never exceed 1/16 in.



3. Q—Is it possible to sand a curved edge perfectly square with the face of the stock?

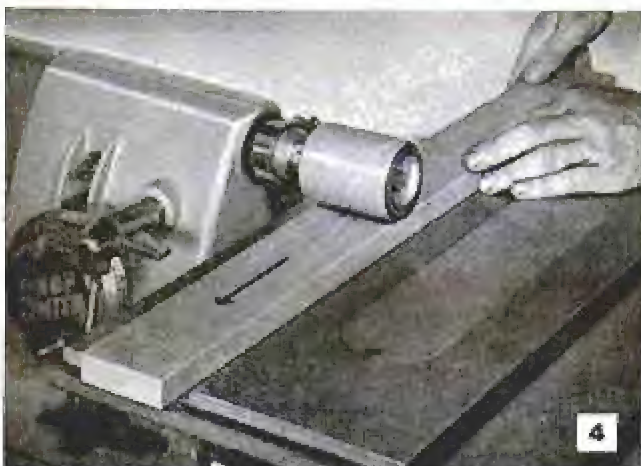
A—Yes. Set up the job in the drill press as shown. Make an auxiliary table of plywood, drilling a hole through the plywood at the center slightly larger than the drum. Lower the spindle so that end of the drum is about 1/2 in. below surface of auxiliary table

4. Q—Can the drum sander be used to sand narrow strips to a uniform thickness?

A—Compare the setup in Fig. 4 with that in Fig. 2. In both setups the work passes between the drum and the machine table and will be sanded to a uniform thickness determined by the table setting. Feed the work slowly and always against the rotation of drum

5. Q—How about sanding a radius on the end of a furniture leg to fit against a round column?

A—The radius of the sanding drum must be near that of the turned column the part is to fit. Use the machine table to support the work with its center line on the center line of the drum. Bring up the ripping fence to help support and guide one end of the leg



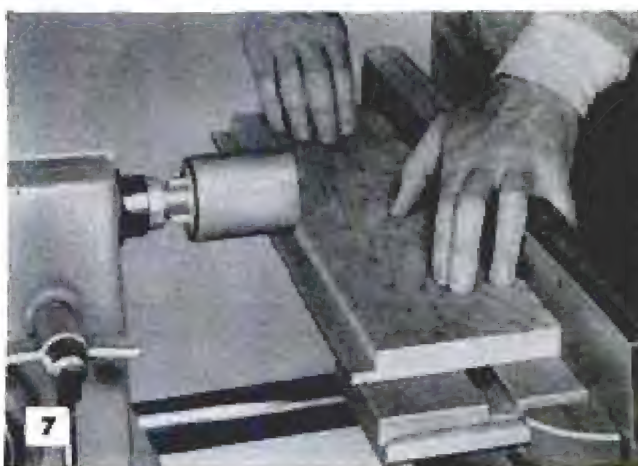
6. Q—Is it practical to joint the edges of stock with a sanding drum, using a fence to guide the stock?

A—This can be done either on the drill press or the radial saw, and is practical when no jointer is available. On the radial saw, use the regular stop as a guide, tilt motor to vertical position and set drum to cut about 1/32 in. at each pass. If drill press is used for this job, clamp guides to the long auxiliary table



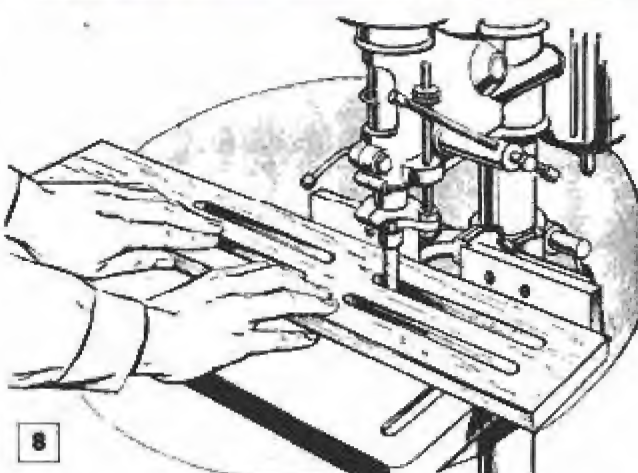
7. Q—Can a wide rabbet, sometimes used in making raised panels, be smoothed with a sanding drum?

A—This is a practical operation on a multipurpose machine. First, extend the sanding sleeve about 1/32 in. beyond the end of the drum so it will cut into the corner of the rabbet. Then adjust table to give a light cut and bring up the ripping fence to guide the work. Always feed against the rotation of drum



8. Q—Are sanding drums practical for smoothing narrow slots and intricate jigsawed patterns?

A—Drums come in sizes from 1/4 in. up and the smaller sizes are useful for working in slots or fretwork down to 1/8-in. radius. Small drums and abrasive rods work best when mounted in a drill press. An auxiliary table is unnecessary as smaller sizes of drums and rods will pass through hole in the regular machine table

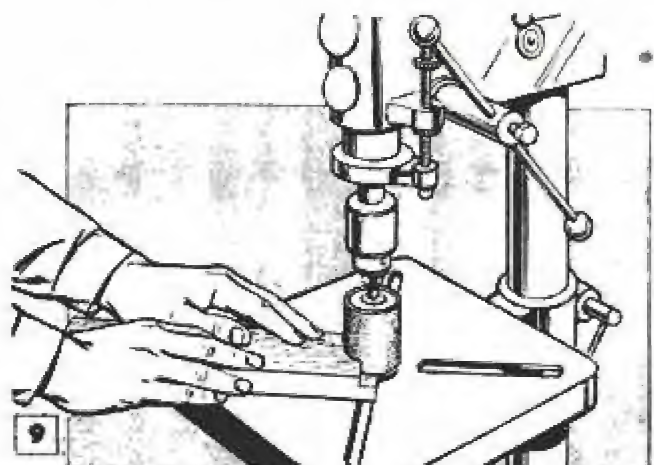


9. Q—In some types of work rabbets are cut with a part of the shoulder curved. How is it sanded?

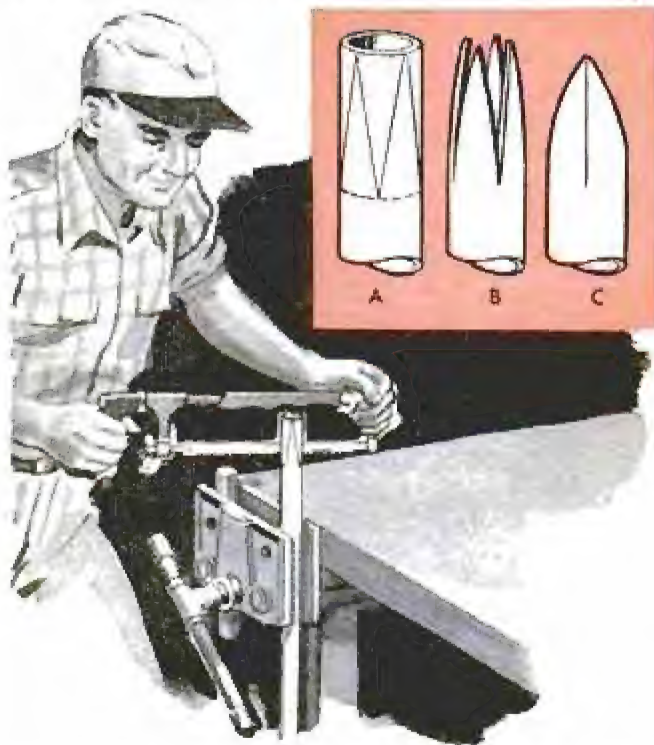
A—First, adjust the sandpaper sleeve on the drum so that the edge of the sleeve extends about 1/32 in. Then chuck in the drill press and lower spindle until edge of sleeve touches cheek of the cut. A light pressure on the work is necessary to prevent scoring surface of shoulder. It's best to use fine abrasive

10. Q—What, if any, are the advantages of using a sanding drum on a flexible shaft?

A—By driving the flexible shaft from an individual motor as pictured, or from a drill press or multipurpose tool, you can work on large pieces that cannot be handled easily on machine tables. Using a flexible-shaft drive the drum can be operated effectively in any position. Use medium to coarse abrasive



Pointing Pipe Stakes Makes Them Easier to Drive

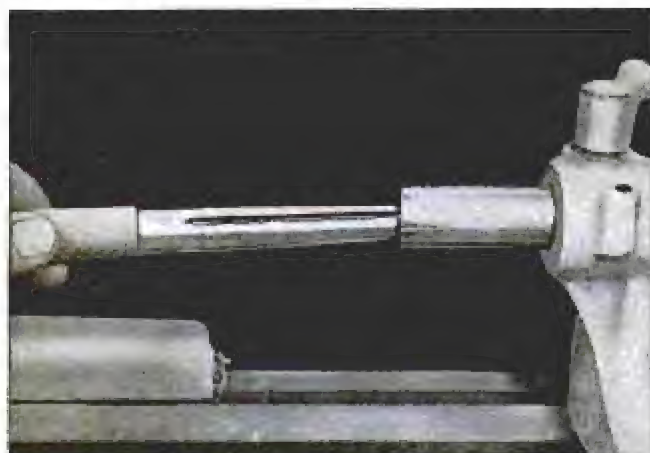


Stakes made from lengths of pipe drive much easier and more accurately in undisturbed soils if you take time to point them. Mark the end of the pipe as in detail A at four equidistant points and scribe four identical triangles, the length of each being equal to twice the outside diameter of the pipe. Then saw out waste with a hacksaw to form four points as in detail B. Bend points together as in detail C.

Safety-Razor Sanding Block

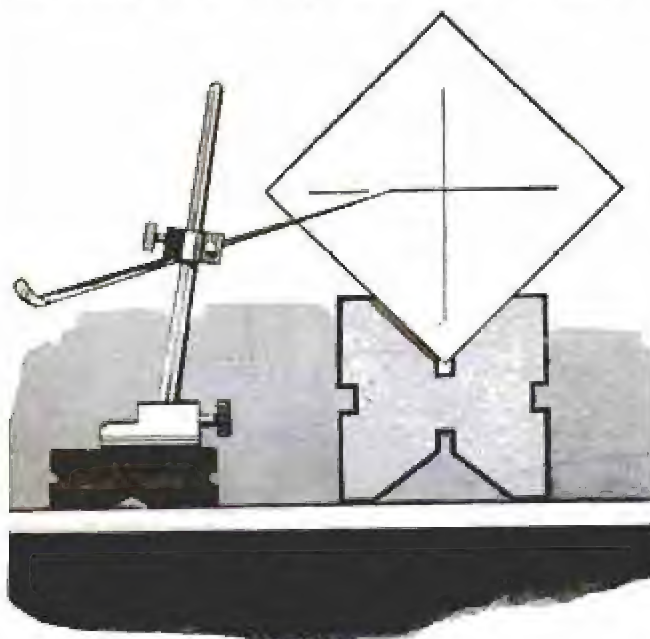
An old safety razor, of the take-apart type, makes an excellent sanding block for small curved or recessed surfaces. The sandpaper is held in position by tucking the ends between the head and comb of the razor, and locked in place by tightening the handle. When using fine paper, several pieces can be installed and time saved by pulling the used piece away when it becomes worn.

Lathe Spindle Tapers Cleaned Safely With Brass "Reamer"



When setting up the lathe to machine stock between centers, it is essential that the spindle and tailstock tapers be cleaned before inserting the centers. Even the tiniest metal chip in one or both tapers can cause errors in machining by throwing the centers slightly out of line. Instead of relying on a cloth wiper, machinists in tool-rooms and school shops make a special cleaning tool from soft brass. One end is turned to a taper and provided with four to six grooves to serve as chip traps. The other end is knurled to provide a firm handhold.—H. J. Gerber, Stillwater, Okla.

V-Block Holds Square Stock When Locating Centers



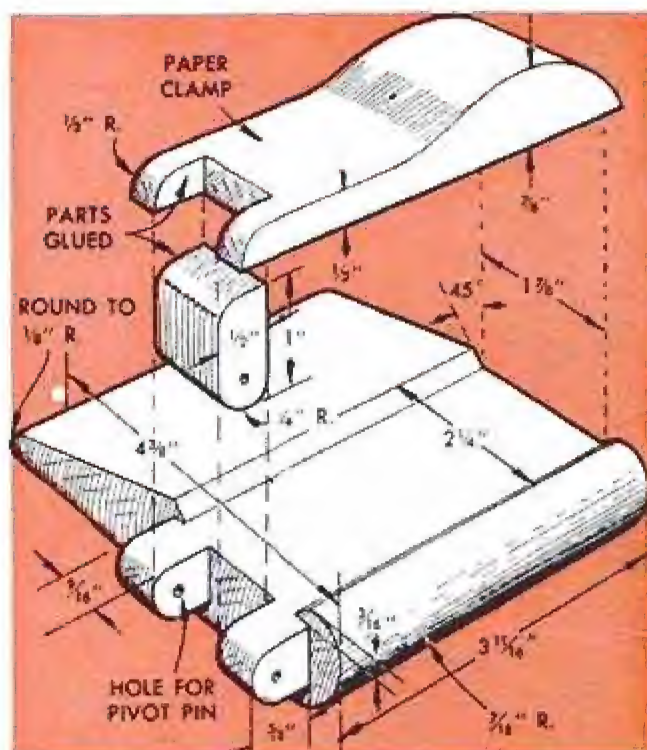
When the accuracy requirements are only average, centers can be scribed on square stock simply by using a surface gauge and V-block. Set up the job on a surface plate, place the work in the V-block and set the scriber point to one corner of the stock. Then scribe the first line. Shift the stock 90 deg. and scribe the second line to intersect the first. Two precautions are necessary: Wipe the stock with a clean cloth wiper to remove all metal chips and grime. Do the same with the V-block and make sure that the chip-clearance groove at the bottom of the vee is clean. Small metal chips on any of the milled surfaces or in the clearance groove may cause inaccuracy in the layout. Where the pieces to be center-marked are more than 5 in. in length, use a pair of matched V-blocks.
Frank LaSaracina, New York City.



DUAL-PURPOSE SANDING BLOCK

For sanding both old and new work it's handy to have a sanding block with one flat surface and two radii. With a block shaped to a given radius on each edge you can work concave surfaces such as those on moldings and picture frames as well as a table top or other flat surface. The block pictured above and detailed at the right combines these features and in addition provides a hinged clamp which holds the ends of the sandpaper firmly. As dimensioned in the detail, the block takes one third of a standard 9 x 12-in. sheet of sandpaper. The block proper is cut from $\frac{7}{8}$ -in. hardwood and rounded on one edge to a $\frac{1}{16}$ -in. radius and on the other to $\frac{1}{8}$ in. As indicated, the hinged clamp, or leaf, is shaped to provide a comfortable palm rest. No padding is used as the block is designed for finish sanding to a true, flat surface.

—J. W. Nash, Sayville, Long Island, N. Y.



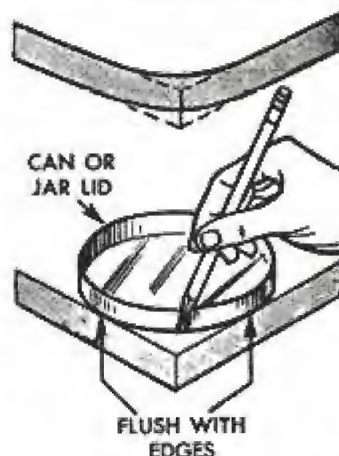
Roof Coating in Colors

A new protective metallic finish that comes in colors makes it possible to reroof your home with a paintbrush. It waterproofs, insulates, decorates and preserves any type of roof. The finish also is suitable for use on asphalt siding, exterior metal surfaces, boats, life rafts and for waterproofing outdoor swimming pools. Comes in red, blue, green, brown, gray, colonial white and aluminum. It's formulated from refined asphalt, long-fibered asbestos, aluminum and pure color pigments.

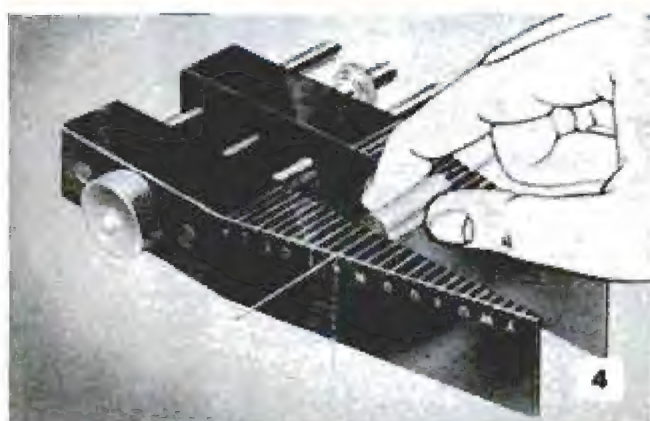
❏ Candle wax may be removed from furniture without damaging the finish by using a piece of stiff cardboard to scrape off the wax. Then, wash the stained portion with mild soap and water, rinse, allow to dry and re wax the affected area.

Radius Scribed With Can Lid

Scribing the guide line for rounding a corner either by sawing or rasping can be done in a jiffy with a can lid. The method is accurate enough for rounding corners on tabletops and shelves and saves minutes over conventional methods making use of a compass. Just place the lid at the corner of the work with the two sides of the lid flush with the edges. Mark with a pencil and there you are, ready for cutting with a jigsaw.



SHOPPING FOR TOOLS



1. IMPACT-HAMMER UNIT can be driven by any $\frac{1}{4}$ -in. portable electric drill on a flexible shaft. Unit is supplied with two Morse-taper adapters to use standard masonry drill bits from $\frac{5}{32}$ to 1 in. Body of the tool serves as a convenient handle and is perforated to dissipate heat. Has a built-in shock absorber to reduce operational vibration to minimum

Hammer-Drill Co., 514 Greenwich St., New York City 13

2. REEL prolongs air-hose life and saves time and space in welding shops. Comes with mounting brackets for attaching to ceiling, wall or floor. Spring motor provides rewinding power. Special pawl locks hose at any desired length. Light pull on hose releases pawl, permitting hose to be rewound automatically. Models are supplied for $\frac{3}{16}$, $\frac{1}{4}$ -in. hose

United Specialties, Inc., Main and Mosby Sts., El Dorado, Ark.

3. CAMPER'S AX is only 12 in. long over-all and weighs just 1 lb. Head and handle are hollow, can be filled with sand when more weight is needed. Made from aluminum alloy having a fine-steel cutting edge molded into the head. Indispensable for campers, woodsmen, fishermen and hunters who must pack a minimum of weight when traveling in remote areas

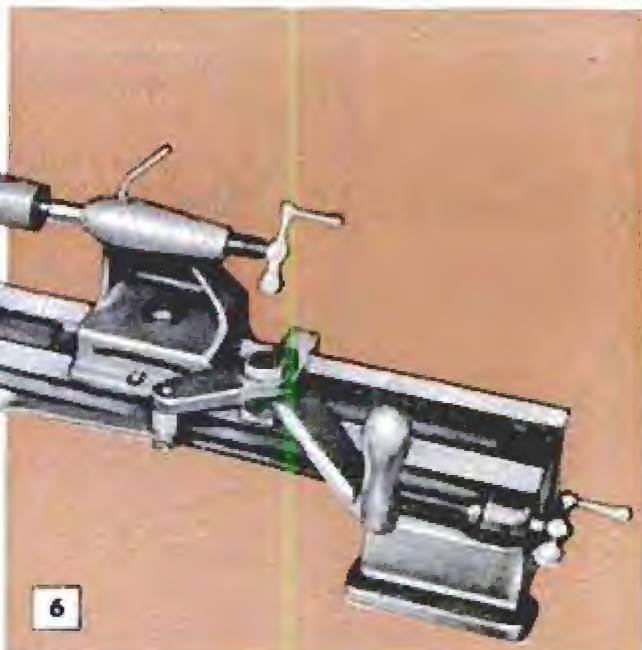
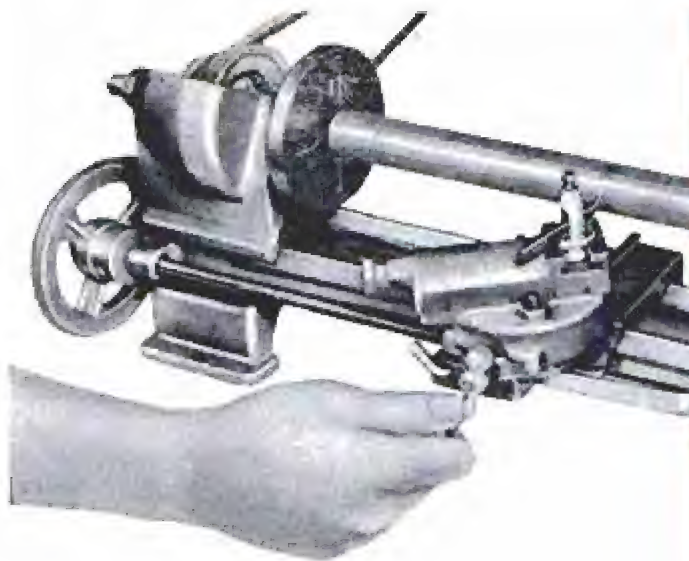
Safety Research and Mfg. Co., Maritime Bldg., Seattle 4, Wash.

4. UNIVERSAL BENDING BLOCK eliminates plier damage and simplifies and speeds up the rather delicate operation of bending leads on resistors, capacitors and other electrical components while assembling these units according to printed circuits. Block is adjustable to accommodate any component body length from $\frac{1}{4}$ to $1\frac{3}{4}$ in. Weighs only 10 ounces

Dy-Buk Co., 4314 W. Pico Blvd., Los Angeles 19, Calif.

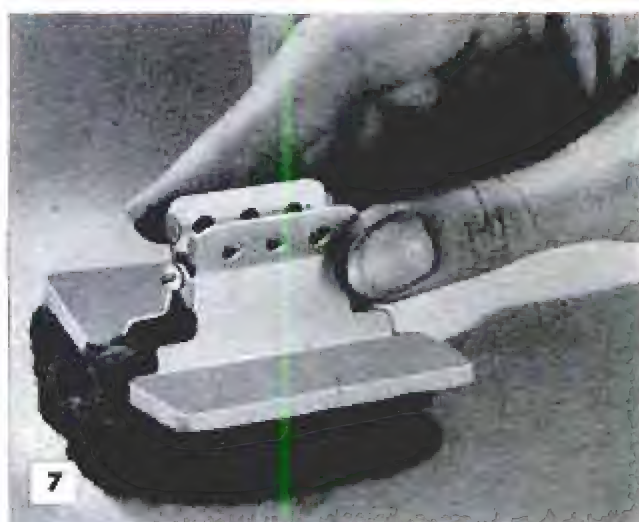
5. VIBRATION-DAMPENING PADS for light machines can be cut from this material to the required size and shape with ordinary scissors. Made from Neoprene, material comes in ribbed sheets $\frac{3}{8}$ in. thick and 18 in. square, the ribs running in two directions on opposite sides of sheet. Recommended load on a pad cut from a single sheet is 50 lb. per sq. in.

Vibration Mountings, Inc., 98-17 50th Ave., Corona 68, Long Island, N. Y.



6. METAL-CUTTING BENCH LATHE is just the right size for modelmakers and others who need a small lathe for light, close work. Bed is 30 in. long, has two 60-deg. V-ways and is ribbed for extra strength and rigidity. Takes 20 in. between centers, swings work 7 in. in dia. over bed. Compound swivels through 360 deg., is locked to carriage with T-slot bolts

King Corp., 2757 Euclid Ave., Cleveland 15, Ohio

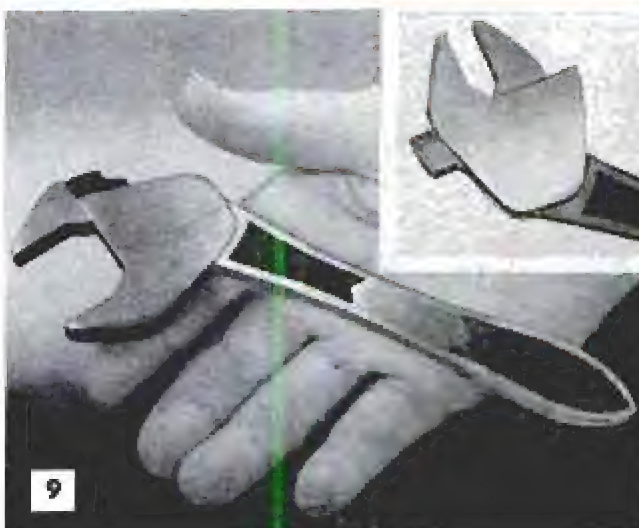


7. STEEL-WOOL HOLDER protects the hands, grips pad firmly and permits application of greater pressure when cleaning kitchen utensils, woodwork or cutting the gloss on finishing materials between coats. Made of aluminum with rubber guards to prevent fingers from coming in direct contact with the steel wool. Pad is instantly released by pressing handles

Quality Metal Products, Inc., Ozone Park, N. Y.



8. FLEXIBLE LINK SHAFT is designed to permit application of equal torque in both directions. In this it differs from flexible-shaft cores which are made from spirally wound wire, permitting torque to be applied in only one direction. Designed to operate inside various types of covers such as armored Neoprene hose, nonmetallic hose and semirigid tube Clark Flexible Link Shaft Co., Box 73, Newton Highlands 61, Mass.



9. SELF-LOCKING WRENCH is adjusted to fit any nut within its capacity simply by placing movable jaw against nut and swinging handle. Jaws adjust automatically to nut size. Pressure on handle causes jaws to grip nut; the greater the pressure, the tighter the grip of jaws. To loosen nut, simply turn wrench over, swing handle in opposite direction

Superior Sales Enterprises, 1508 N. Vermont Ave., Los Angeles 6, Calif.



Radio Aids to Carefree Cruising

By L. M. Dezettel

Fig. 1. Motorola's Weatherama, a transistorized portable covering beacon and standard broadcast bands



IF THERE'S ONE THING that the estimated 30 million "week-end sailors" who operate some six million pleasure boats in the U.S. have in common, it's their enthusiastic endorsement of boating as a sport and hobby. Yet, many of them, from personal experience, will agree that it can also be one of the most hazardous of pastimes. If you're out in your boat, for example, and fog starts to close in, you suddenly become the "last man on earth." It is of little comfort to know that shore is but a mile or two away, or that there's another boat almost within hailing distance. The waves lapping against the side of the hull suddenly take on an ominous tone and every sound becomes a warning of impending danger.

Situations such as these can fill even a hardened part-time mariner with apprehension unless his boat is equipped with some of the electronic instruments which guide his course and provide aid and comfort under almost any condition.

Today, boating, whether for business or pleasure, is no longer a "by guess and by golly" proposition. Electronic firms, keeping pace with the rapidly expanding boat industry, are providing sensibly priced equipment which can make cruising more enjoyable and carefree for you and your family.

Probably everyone who expects to spend more than an hour or two in a boat will equip himself with a radio. In many powerboats, salvaged automobile receivers provide an inexpensive means for excellent reception, while in other craft, battery-operated portables are employed. In addition to continuous entertainment, these radios also give intermittent weather forecasts and emergency storm warnings which are broadcast in many local areas.

Some currently available portables cover the marine and aircraft-beacon band in addition to the standard-broadcast frequencies, see Fig. 1. With these, far more frequent and detailed weather reports can be obtained. Since most portables have built-in directional antennas,

they can also serve as crude direction finders in case of emergency.

Radio Direction Finding

One of the most useful instruments aboard pleasure boats is the radio direction finder. When cruising out of sight of familiar landmarks, or when weather conditions make visual navigation difficult, the RDF, properly calibrated, can be depended on to guide you to your destination safely and accurately.

But even the best direction finder won't stand up and shout "land five miles off the port bow." To derive maximum benefit from these versatile instruments, the operator should be aware of their capabilities and the characteristics of the marine radiobeacons.

Marine Radiobeacons. As an aid to safer navigation, the U.S. Coast Guard has blanketed our coastlines with a vast network of radiobeacons. Each of these transmits on its assigned radio frequency a

Fig. 2. Typical marine-radio direction finder and normal directional characteristics of loop-type radio receiving antennas

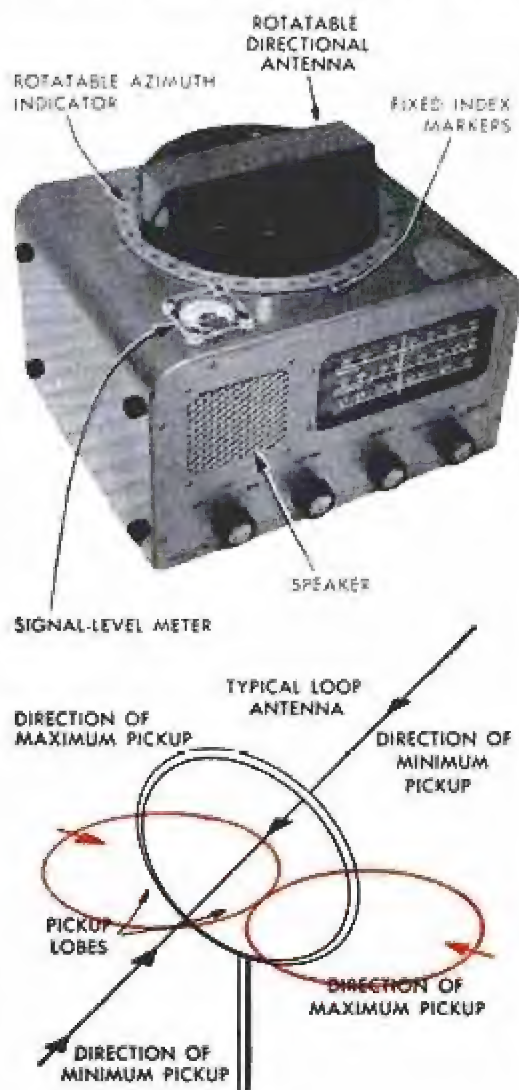
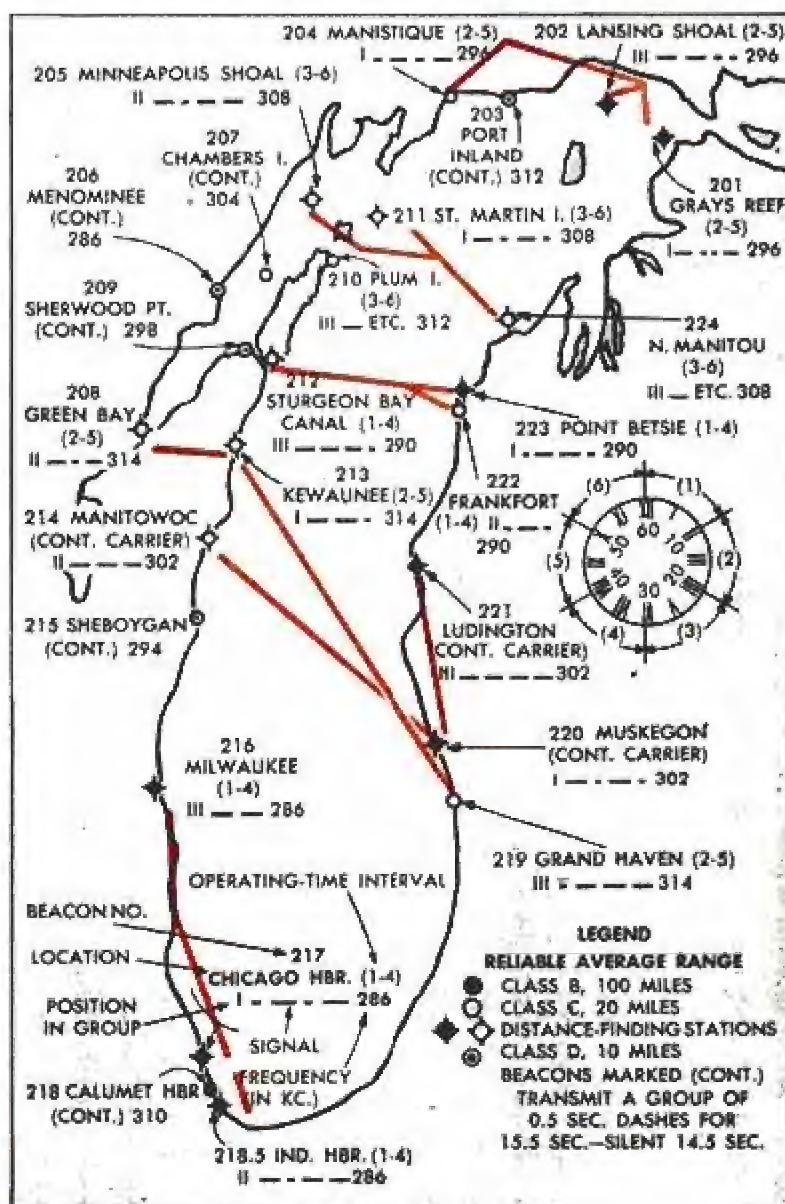


Fig. 3. Location and characteristics of marine radiobeacons in Lake Michigan area. Clockface shows operating-time intervals



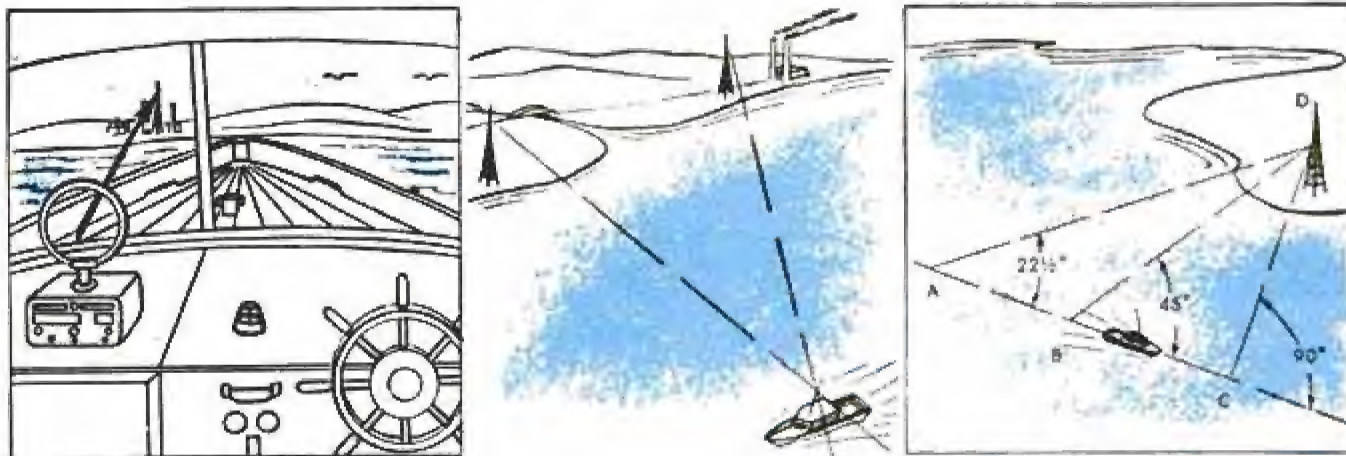


Fig. 4. Major RDF applications. Left—piloting on a beam of silence. Center—plotting position. Right—distance calculations, when bearing angle is doubled, distance run equals distance to station. $AB=BD$; $BC=CD$

series of dits and dahs which identifies its location.

Fig. 3 shows the location and characteristics of beacons in a typical area. Some of these operate in groups of two or three, as indicated by the colored connecting lines, while others operate independently. All beacons in a specific group transmit on the same frequency and broadcast in rotation, at designated times, twice every hour.

To determine how this system works, note the clockface in Fig. 3 which has been divided into six 10-minute intervals. These intervals, labeled 1, 2, 3 . . . consecutively, describe the normal operating schedule of the various beacons. For example, beacon No. 217, at Chicago Harbor, operating in time interval one and four (1-4), transmits during the first and fourth 10-minute period of every hour. This station belongs to a group comprising beacons Nos. 216, 217, and 218.5, all of which transmit during the same time interval.

Since all of these beacons operate on one frequency, simultaneous transmission would cause serious interference. To avoid this, the beacons broadcast consecutively, in the indicated I, II, III order. At the beginning of each hour, beacon No. 217 (I in the group) broadcasts its — — — signal for one minute. This is followed for one minute by the — — — signal from beacon No. 218.5 (II in the group), and finally by the — — signal from No. 216. This sequence is repeated three times at the beginning of each half-hour transmitting interval. (In the 2-5 interval, beacon II starts the transmitting sequence, while during the 3-6 interval transmission begins with beacon III. During fog, all beacons in the affected area operate continuously in the regular sequence.)

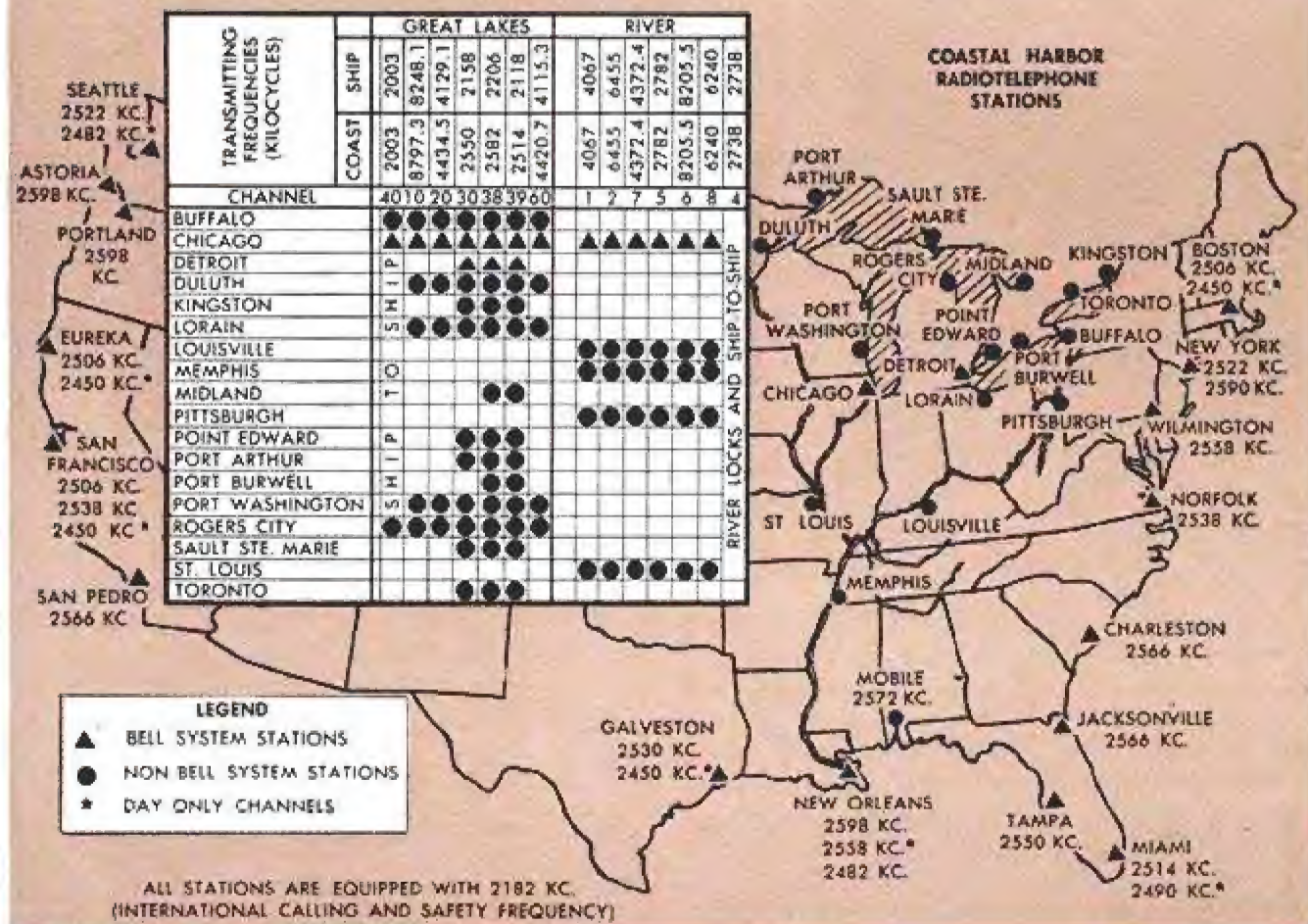
Direction Finder Characteristics. Leaving the subject of radiobeacons for the moment, let's investigate briefly the direction finder itself. A typical unit, see Fig. 2,

consists of a sensitive radio receiver, a rotatable azimuth scale, one or more fixed-index markers and a directional and rotatable loop antenna. The latter may be considered the heart of any DF equipment.

Any antenna loop, whether it consists of an actual circular configuration or simply of some wire wound around a slender ferrite core, has very definite directional characteristics, see Fig. 2. When rotated so that its plane is broadside toward a station, it picks up very little or no energy from the signal of that particular transmitter. This property of loop antennas forms the basis of all direction finders and makes the first major function of such equipment, that of "homing" on a fixed radio-signal source, readily apparent. Assuming that the direction finder is installed with its index markers parallel to the keel of the boat, it is possible to steer an unerring course toward any destination having a beacon or broadcast station simply by setting the antenna pointer to the index marker and heading the boat in the direction which gives a minimum signal indication on the direction finder's null-indicating meter or from the loudspeaker.

The ability to take a "fix" on any radio-signal source can be used to accomplish the RDF's second major function—that of plotting your own position. To do this, the azimuth scale is set so that the fixed-index marker indicates the true bearing of the boat, as shown by a compass reading corrected for local magnetic variations and compass deviation. The receiver is tuned to the frequency of the nearest beacon group. When this beacon group goes on the air, the antenna is rotated for a null indication for each beacon in turn and the bearings of these, as indicated on the azimuth scale by the antenna pointer, are jotted down. When these bearings are plotted on a chart, the intersection of the bearing lines shows the location of the boat.

A direction finder plus a knowledge of



Courtesy Bell Telephone Co.

Fig. 5. Wherever you may cruise, you are almost certain to be within radio range of a harbor station

fundamental trigonometry will permit you to calculate the distance from your boat to any fixed-signal source, as illustrated in Fig. 4. Additional distance-finding possibilities are provided by many of the radiobeacons which are designated as distance-finding beacons. During a fog these beacons transmit, near the end of their regular operating minute, a one-second dash, followed by a one-second silence and a long dash of either three or five seconds duration. These two dashes are synchronized with similarly timed blasts from a sound fog signal. The number of seconds elapsing between the end of the long radio dash and the termination of the long blast

from the foghorn (as heard by the observer) will, when divided by 5.5, give your approximate distance, in nautical miles, from the light station.

Because the nearness of any large objects can affect the directional properties of loop antennas, any direction finder should be calibrated after installation. For this purpose, any radiobeacon will broadcast, on request, a continuous signal at any time other than its regularly scheduled broadcast time. Requests for calibrating signals may be made by radiotelephone or by prearranged agreement.

The ability to call for and receive aid,

(Continued to page 258)

Fig. 6. Typical radiotelephones for pleasure craft. "Portable" unit, center, operates from built-in batteries

Courtesy Marine Radio Equip. Co.—Chicago

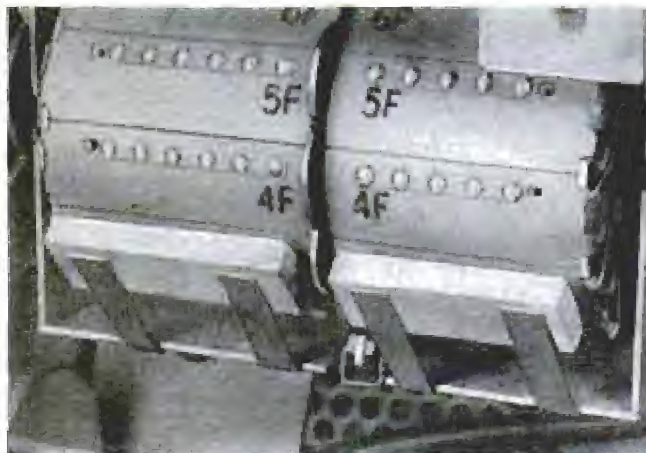
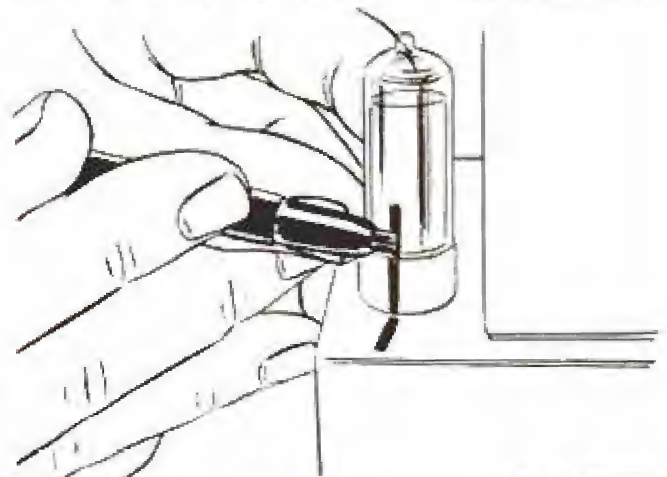


TV TIPS



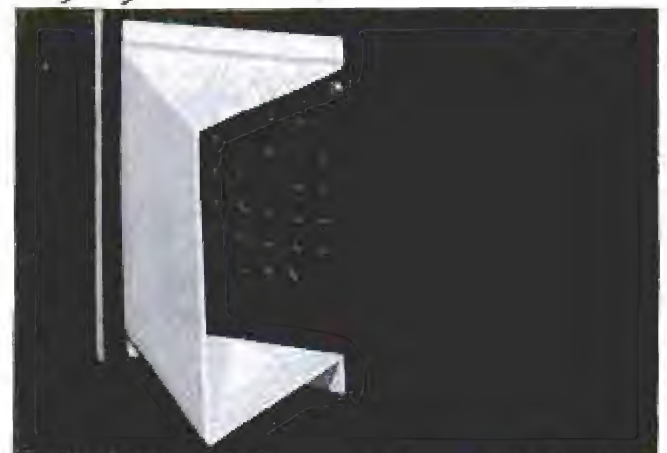
IF YOUR TV PICTURE TUBE picks up distracting reflections from a floor or table lamp, end this annoyance by fastening a sheet of aluminum foil inside the lamp shade (above). Properly installed, foil will not mar the appearance of the shade. G. F. STILLWELL

FRAGILE MINIATURE TV TUBES (below) are often damaged while being reinserted in their sockets after having been removed for checking. When socket holes are not visible, as with shielded sockets, draw a guide line along the lower portion of the tube and chassis, using a crayon or grease pencil, before removing the tube. Tube can then be easily reinserted by lining up the two marks. G. F. STILLWELL



CONTACTS OF TURRET-TYPE TV TUNERS must be cleaned frequently to prevent noisy and spotty reception. Cleaning pads, made and mounted as shown above, reduce the frequency of this annoyance. Pads are made of hardwood, slightly curved, and faced with a hard grade of blotting paper. Spring-metal strips hold pads against turret and contacts are cleaned automatically when tuner is rotated.

H. Y. MOON

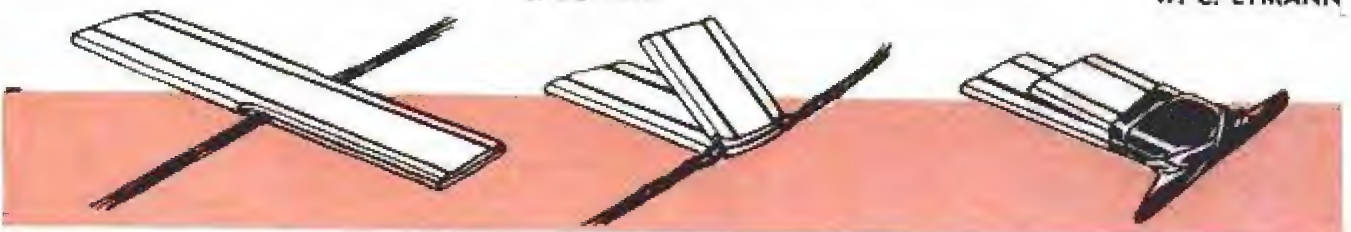
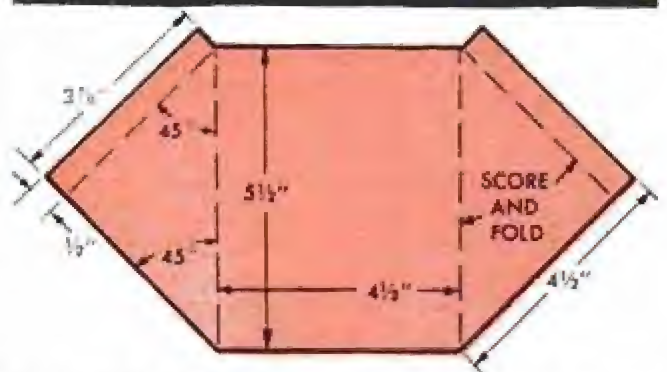


TO SPLICE two pieces of TV twin-line, follow the method shown below. Cut insulation along outer edges and pull wires away from ribbon. Place one piece above the other, twist the corresponding leads together and solder. Cut off superfluous insulation. Taping removes strain from soldered joints.

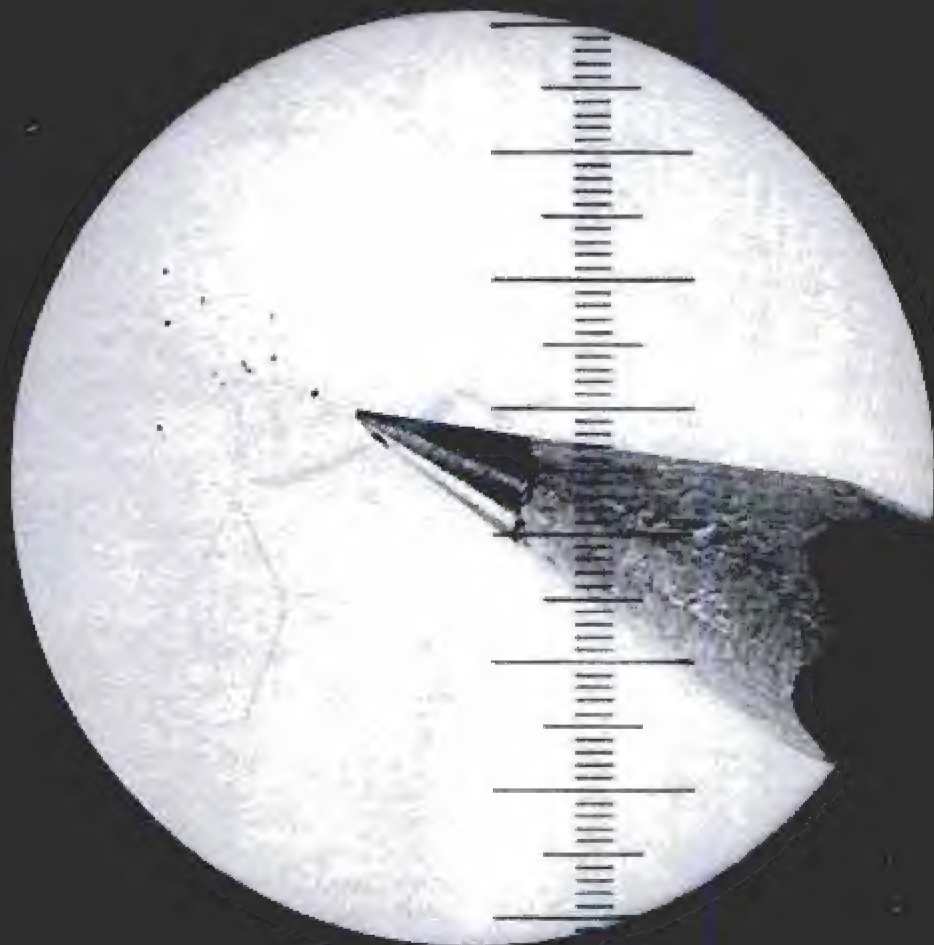
E. DEVORE

TV-SOUND REDIRECTOR (above) increases volume and improves audio quality of receivers with small side-mounted speakers. Redirector, made of heavy cardboard and fastened to cabinet with cellulose tape, effectively channels sound towards listener.

W. C. EYMANN



specks the size of a micron



can shorten your engine life

Waste and abrasive particles *far too small to see* with the naked eye can have a deadly effect on engine performance. That's the problem that led to the development of the MoPar Micronic Oil Filter. It eliminates even these particles from the oil system, to the size of a *micron* (.000039 of an inch).

This means that the filter catches over $\frac{1}{3}$ more dirt per square inch than ordinary filters. Chrysler Corporation Engineers perfected the method by means of a special filter element paper. These "Forward Look" engineers also developed—

- greatly increased filtering speed—because the filter surface area is over 8 times larger than conventional types—571 inches against 69.
- far greater capacity—3 to 5 times the capacity of a waste-type filter of corresponding size. And there's no unloading, warping or distorting.

If you demand top engine performance and value your engine life, you'll use a MoPar Micronic Oil Filter. The name MoPar means *genuine* Chrysler Corporation parts and accessories, made to highest precision standards. Available at all Plymouth, Dodge, De Soto, Chrysler or Imperial dealers, or leading independent repair shops.

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You Can Forecast Weather By the Clouds

(Continued from page 112)

As you travel, you might notice that the closer you get to the equator, the higher are the clouds. This is because the earth rotates, causing centrifugal force to swing the atmosphere and its clouds outward. Weather and clouds go up about five miles near the poles, 7½ miles in the temperate zones and 10 miles at the equator. Because warm air ascends and cold air descends, winter skies are lower than summer skies.

Cloud heights are something you will be able to ascertain with a little practice. Fair-weather cumulus averages 4000 feet at the base, alto-cumulus and other middle clouds average 10,000 to 20,000 feet. From 25,000 up, clouds are composed of ice droplets instead of water droplets, so cirro-cumulus ("mackerel" sky), cirro-stratus and lofty cirrus are all ice clouds which the sun and moon can shine through without making a shadow. Cirrus scratches the floor of the stratosphere where the thin air is cloudless and weatherless, some 38,000 feet up.

It all sounds awesome and strange, yet you are making a true cloud when you breathe out winter air, condensing the warm wet air from your lungs into visible droplets. Air moves from west to east about 600 miles a day; how odd, then, to realize the air you breathe was hundreds of miles away yesterday, and the air you exhale will be abroad in a few more days.

Such simple truths are part of a weather wisdom we all should have, particularly in this age of space-travel conjecture. We suddenly find that the sky is part of the earth, a thin layer of stuff we live in just as the fish live in the sea. The surface of the earth is not beneath our feet at all—it lies overhead, just a little way beyond the clouds. ★ ★ ★

Science Out-Foxes Radar

Radar's probing "eye" possibly has been blinded. From England comes the announcement that scientists have discovered a material that absorbs radar pulses. It is made of foam-rubber panels bonded to brass and ceramics. Successful tests already have been made. This is the first known possibility that radar warning defense can be defeated.

☛ More sunspots were observed during 1957 than at any time in recorded history, according to National Bureau of Standards.

"like having Wings on your feet!"



Modern Mercury! Jim Rusing,
ski director at Florida's Sunshine Springs.
Photographed at Sunshine Springs, Sarasota.

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Sanding Floors

Q—I plan to rent a floor-sanding machine for refinishing the hardwood floors in several rooms on the first floor of my older home. The finish on the floors seems to be in fair condition but is much discolored and shows wear in the traveled areas. I'm told that if I use turpentine on the floor the sander will do a much better job. Is this true?—O. M., N. Y.



A—Yes, but have you thought of the fire hazard? Should the sander strike a nail a shower of sparks is likely to result. The danger of igniting the turpentine film should be obvious. Because of this we could not recommend the use of any volatile solvent for the purpose that has been suggested to you. This also would be true of carbon tetrachloride, which is nonflammable but presents a health hazard due to the toxicity of the fumes. Generally it is best to use a coarse open-coat abrasive the first time over an old floor. Use a comparatively light pressure so that the open-coat abrasive only breaks the finish film but does not cut down to the bare wood. This procedure usually tends to prevent clogging of the abrasive. Go over the floor a second time, cutting a little deeper. Follow with a medium-grade open-coat abrasive, cutting through to the bare wood. Follow with a fine abrasive to remove the scratches from the surface. Usually this procedure produces good results on an old floor, but much depends on the condition and age of the original finish, of course. In some instances it will pay to remove the old finish with a paint and varnish remover before sanding. When this is done be sure to provide adequate ventilation.

Refinishing Leather Upholstery

Q—I have a large leather-upholstered chair. The upholstery is rather worn at the corners of the cushion and on the tops of the armrests. There are a few small cracks at these points but they do not seem to go clear through the leather. Is there any way of refinishing leather upholstery?—R.M., N. Y.



A—If you are sure that your chair is upholstered in genuine leather and not the so-called imitation leather or other types of leather substitute, then the question of whether or not it can be successfully refinished depends almost entirely on the extent and nature of the wear or other defects. Special enamels and dyes are available in a wide range of colors and are easy to apply by following

(Continued to page 230)

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The Gabriel Co. • Cleveland 15, Ohio



AJUSTOMATIC SHOCK ABSORBERS

(Continued from page 228)

the manufacturers' directions. The colored enamels are more or less opaque and are quite effective in hiding ordinary defects. The dyes color the material without entirely hiding the characteristic texture and graining of the leather. It is very important that all surfaces of the upholstery be thoroughly cleaned before either of these refinishing materials is applied.

Picture Spots Wall

Q — Recently, I moved several large pictures which had been hanging for some time in the same place. Dark spots of the exact size of the frames now appear on the wall. How can I remove these unsightly spots and prevent their recurrence?—S. H. Wash.



*A—*As a rule, it is rather difficult to remove the spot entirely by ordinary means without damaging the wall or covering, as some wall coverings fade less behind the picture. However, most of the soiling is due to a lack of air circulation, which allows dust to collect back of the frame. If the walls are painted with a washable oil paint, a household paint cleaner will remove the grime and dust, making the spot less noticeable. Clean papered walls with a wallpaper cleaner. When hanging the picture, drive a tack at each lower corner of the frame, letting the head project from $\frac{1}{8}$ to $\frac{1}{4}$ in. The tacks hold the picture away from the wall, permitting air to circulate freely and preventing the accumulation of dust.

ANSWERS TO "TRAFFIC QUIZ FOR BOATERS," PAGES 164-165

1. Boats of all types while under way must keep clear of boats fishing. Already you are wrong for not giving the fishing vessel a wider berth. Also, you are on a collision course with the sailboat. Under virtually all conditions, a sailboat has right of way over a motorboat. Forget about the fried chicken. Head slowly off to starboard and give both vessels plenty of leeway as you pass.

2. The boat to starboard—your craft in this case—ordinarily has the right of way, but here a sailboat is involved. Does this alter the situation? Not this time, for the sailboat is under power with an outboard motor. In such a case, the sailboat becomes a powerboat. Thus you definitely have the right of way. However, you should stay alert, making certain the other skipper gives you your rights. Better to yield the right of way than collide!

3. Unquestionably you have the right of way despite the fact that the other craft is a sailboat. Vessels coming out of a slip have no rights until they are entirely clear of the slip or pier. You should proceed cautiously though. The skipper of the sailboat doesn't have the degree of control that you have in your powerboat.

4. The overtaken vessel has all the privileges and your vessel—the overtaking one—has none. That headland to starboard is an obstacle, as the boat ahead may run close to it, cutting you off if you pass to starboard. Better wait until you are in more open waters. In any event, when you plan to pass to starboard, sound one blast of your whistle or horn and wait for his signal of recognition before proceeding.

5. Strictly speaking, you have the right of way and the towboat can't pass until you yield. In this case, common sense should prevail over the rules of the road. That towboat is a lot bigger than your craft. As a matter of courtesy, a boat with an unwieldy tow should be given the right of way. At the first opportunity, let the towboat pass.

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Only the blade moves!
**NO WHIPPIN'
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Totally *different* from any other gasoline-powered saw you've ever seen! Works on entirely different principle: reciprocating blade, **NO CHAIN!** So **SAFE**, so **EASY** to use for **EVERY** kind of outdoor sawing job—for farmers, hobbyists, outdoorsmen, nurserymen, orchard owners, right-of-way and park maintenance, pulpwood operators, etc. Drops trees up to 20" with a single cut—yet follows a chalkline and leaves a smooth mill-edge, for precision cutting. Costs less to operate and maintain. *Pays for itself* in just a few jobs!

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The advanced design of the 340 brings out the ballistic potential of this high velocity, flat-shooting cartridge.

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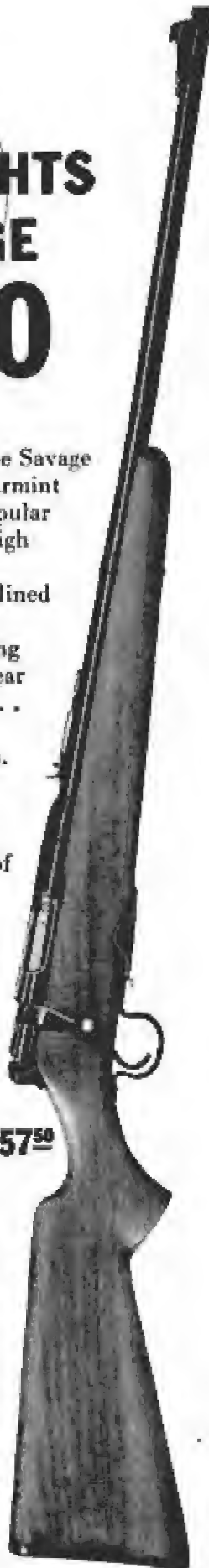
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More Power Lights "Darkest Africa"

(Continued from page 140)

per second in the event of a flood. The reservoir will be full by 1963.

Recent record floods of the Zambesi River seriously endangered the beginning of the project. The swollen river, carrying dead animals and huge trunks of trees with it, raced six feet above the 50-foot-high cofferdam in the narrow Kariba Gorge.

Big Plans For Congo

The floods, fortunately, did little damage. The contractors removed everything that could be moved to a higher level, braced a vital road bridge with extra cables and piled 100 tons of steel girders on it to give it added stability while the Zambesi waters rose two inches per hour.

Farther north, in the Belgian Congo, blueprints are being drawn for the construction of another of the world's largest hydroelectric power plants at Inga, on the lower Congo River. The planners include Clarence E. Blee, chief engineer of the Tennessee Valley Authority. The Belgian Colonial Minister said this dam would give birth to an industrial complex which might well rival the Ruhr in Germany. This project would favor the birth of a series of new industries such as aluminum, ferro-alloys, the treatment of ores, paper and a plant for the separation of isotopes. The scheme is expected to cost about \$3,750,000,000 and take 30 years to complete.

Ghana Needs Power For Smelting

Looking farther north to newly created Ghana, we see the investigations of yet another gigantic hydroelectric scheme, the Volta Project, in progress.

Primary object of the Volta River Project would be the production of about 210,000 tons of aluminum annually. To achieve this output, bauxite mines would have to be developed, a dam and power station would have to be built at Ajena, an aluminum smelter would have to be built, and new railway links between mines and smelters and coast considered.

In addition to these major projects, innumerable smaller hydroelectric schemes are constantly being built all over the continent from Egypt to the Cape of Good Hope. One may well wonder how long it will take Africa to catch up with the more developed areas of the world. At the present rate it should not take too long. Here, there and everywhere in Africa civilization reaches out to tame the wild rivers. And with each one tamed, it will advance on the road to a better life. ★ ★ ★



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Cruising Down the River

(Continued from page 163)

greatest danger on the lower river. If a boat were to be swept beneath a tow its occupants would be carried under at least an acre of barges before they could even hope to come up for air.

We found the Mississippi a much easier river than the Missouri on which to drift. The Missouri's narrow width and snarl of whiplash currents, when combined with the limited control that oars give, make the river a dangerous one. A shantyboater isn't able to haul a boat clear after trouble develops; he has to anticipate trouble before it occurs. The Mississippi's sheer size—its width of more than half a mile contrasts with the 600-foot width of the Missouri at my home—enabled us to ride out in the stream and escape shore hazards. At the same time control was easier because of the Mississippi's fat laziness of current.

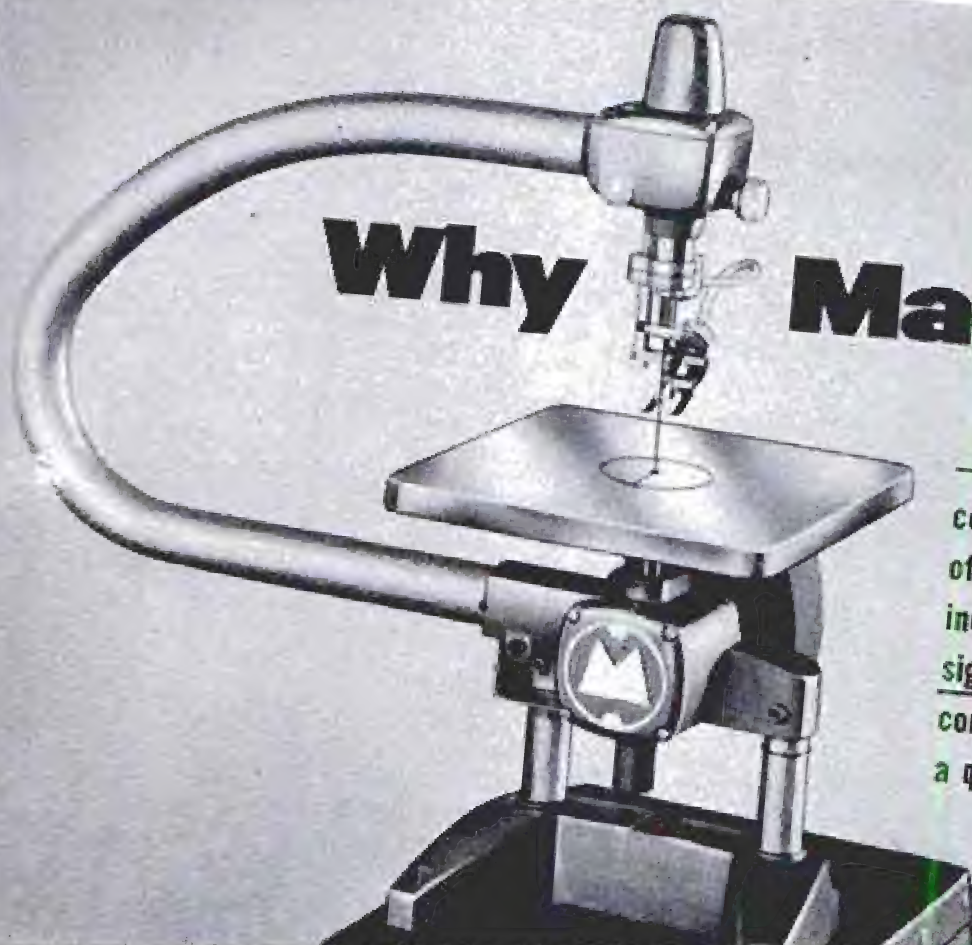
Camping on Sandbars

Against this was arrayed the parade of the towboats, which on the Missouri are a comparative rarity. Had we not swung the shantyboat to take bow on the wake of every passing tow, I think we might have been capsized. Towboats presented a problem at night, as their wakes banged us against the shore to which we were tied.

Although our two extra guests were easily absorbed without crowding, they did overrun our sleeping capacity of four. This caused no hardship. Each evening we headed for a sandbar, motoring in as far as possible, then rowing until the oars dragged bottom. Then over the side we went, wading in with the boat until we found a tiny cove that would give a measure of protection from wave wash of the towboat. Mississippi River sandbars are beautiful, clean with hard-packed sand, and airy in their vastness. There, as the sun went down behind the distant cottonwoods, we would eat our evening meal around a driftwood fire—and water-leached driftwood has a perfume all its own. Two persons had to sleep on shore, and the beach was the preferred spot. The soft warmth of air mattresses and sleeping bags was luxurious, while the open expanse usually caught enough breeze to keep off the mosquitoes. It was wonderful to lie there, watching the stars against the black velvet of the sky while the dying embers of the fire glowed and the tiny lapping of the wavelets close at hand invited sleep.

At Cairo we turned from the Mississippi and began our 44-mile crawl up the wonderfully clear Ohio. Our speed, which had

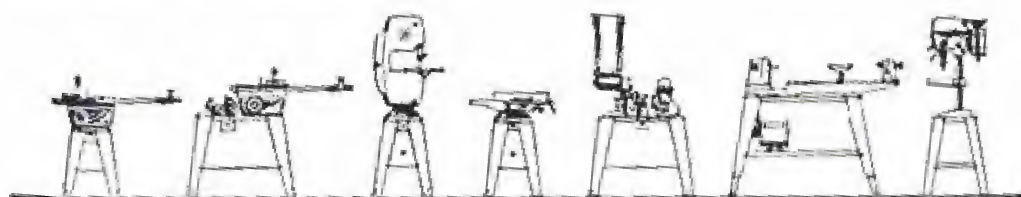
(Continued to page 236)



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ranged between seven and eight miles per hour on the Mississippi, abruptly dropped to between three and four miles per hour. Slow as this was, we were fortunate in being able to ascend the river at all. The Ohio is a succession of dams with ingeniously designed sections that are hinged so that they can be raised or lowered. In time of high water they are folded down on the bottom and the Ohio becomes an open river with a current that would have been too swift for us to buck. Fortunately, we arrived at a time of low water when the dams, which deepen the river to navigable depth, created a staircase succession of pools all the way to Paducah, Ky.

At Dam 53, located above Mound City, Ill., we approached our first lock with some trepidation. One problem was the fact that our boat has neither remote throttle nor reverse controls; when maneuvering is required, John's station is at the wheel while I stand at the stern to operate the motor.

Moving Through the Locks

Actually, it was easy. We took the boat to a spot outside the lock walls and waited for a tow to clear. When the tow moved out and the green light beckoned us in. John did a nice job of piloting. He had to take the boat through the wake thrown up by the departing towboat, meanwhile navigating the narrow opening left when employees closed one of the two gates. He did it deftly and brought the boat to a halt within inches of the mooring bitt. There was no condescension in the tone of a lock employe, amused by the age of our 11-year-old pilot but impressed by his performance, as he addressed John as "captain." The experience was so smooth that our chief reaction was one of being overwhelmed by all the men and machinery working—without charge—to fill a chamber 600 feet long and 110 feet wide for the benefit of as inconsequential a craft as ours.

Though the trip up the Ohio was slow, we found it a delight. At night we gravitated to the Kentucky side which, guarded by a broad band of swamp and bottom jungle, is almost wilderness. We didn't realize how completely alone we had been until, at one landing spot, we found footprints in the sand. Somehow the evidence that another human being had been there snapped the spell and made the place less desirable.

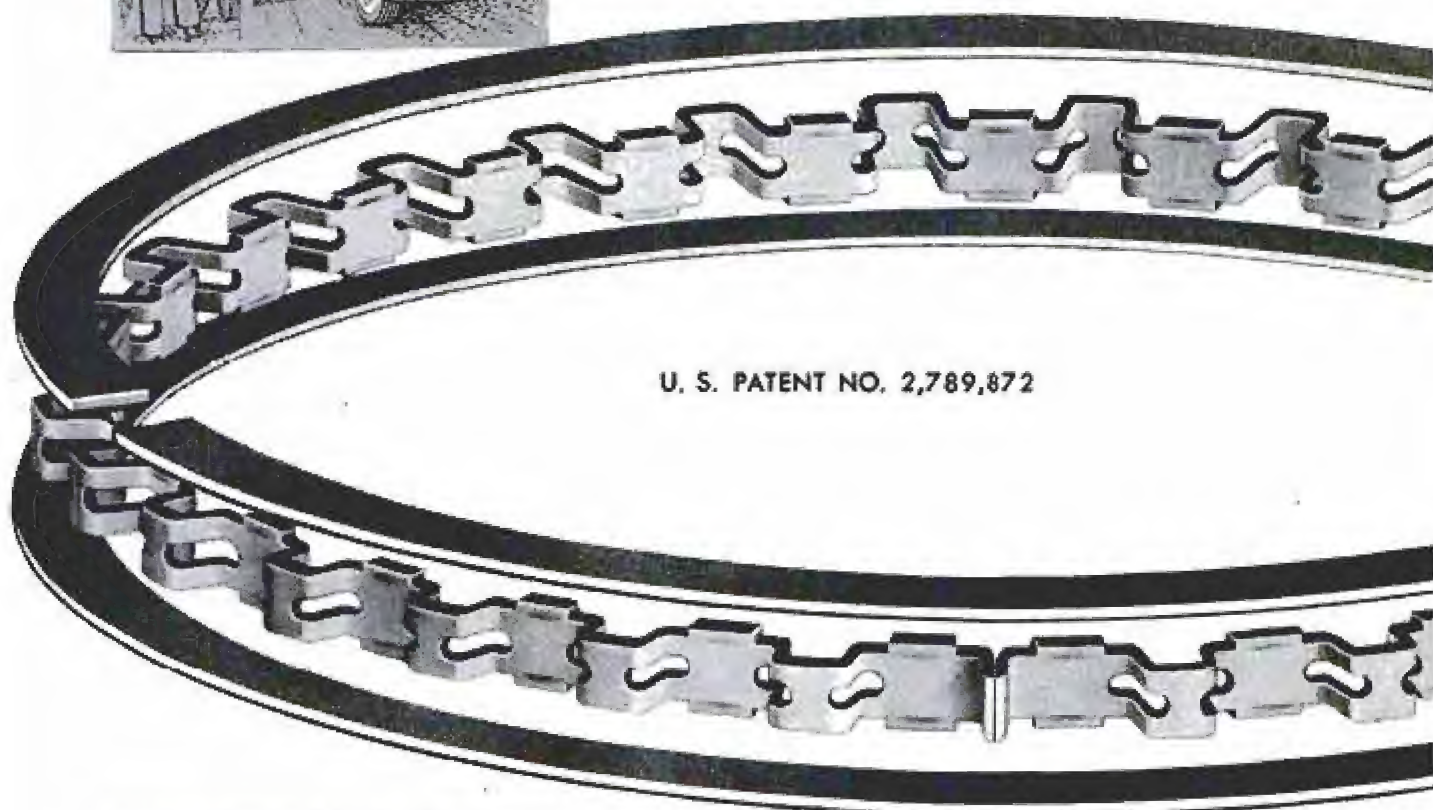
Our Gas-Station Guides

When we needed gas, as we did frequently in the tussle with the river, we of necessity headed for the towns along the Illinois shore. Each landing brought a covey of fishermen's children bursting out

(Continued to page 238)



Sealed Power's NEW STAINLESS STEEL OIL RING



U. S. PATENT NO. 2,789,872



**WAS PROVED AND APPROVED
AROUND THE WORLD
WITH FORD**

Deserts—mountains—rutted roads—sandy trails—heat—cold—great cities—tiny villages—through all these around the globe, the 1958 Ford was tested—and came through with flying colors.

Also triumphant in the Ford engine were new stainless steel oil rings and associated compression rings by Sealed Power—setting their own records for performance, reliability and economy—the SEALED POWER SS-50U does things no other ring can do.

**SEALED POWER CORPORATION
MUSKEGON, MICHIGAN**

of the brush to greet us. Invariably they accompanied us into town to guide us to the gas station, the grocery and the ice plant. Their chatter was as artlessly pleasing as was their gratitude when we rewarded them with a soda—along the Southern rivers a soft drink inevitably is a “sody.” Always they addressed me as “sir” and my wife as “ma’am.” The river is an oasis of juvenile good manners.

At Paducah we turned into the Tennessee and picked our way through the congestion of the busy waterfront for the last 22-mile run upstream.

Tailing a Towboat

When Kentucky Dam came into sight, it loomed up impressively. Lowermost of the 21 TVA dams, its lock is one of the tallest single lift locks in the world, just as its 184-mile-long lake is one of the biggest manmade bodies of water.

I left the boat and went up above to scout out the lock and lake. The lake, its boundary lost against the horizon, was calm in the afternoon sun; I could foresee no difficulty in traveling the three miles to where, the Coast Guard light list told us, a safety harbor lay.

At 5:30 P.M. we moved into position to enter the lock. At 9 o'clock on a moonless night we were still there. While we waited, a bustle of big commercial tows materialized to monopolize the lock. Finally the *Louise* of Louisville, upbound with four barges of coal, entered. We tailed it in.

The first time through such a lock, especially at night, is frightening. In the blackness of the lock's depths, we couldn't tell where the gates left off and the lock wall began. With visions of being caught by the gates, each as tall as an eight-story building, we snuggled alongside the *Louise* and made fast. We looked back to see the gates inching shut to commit us irrevocably to the lock. I think the gates of Hades, when they close, must look like Kentucky's. The water under us began boiling as it poured into the chamber. The *Louise* put its props in motion to ease the strain on its hawsers, and the wake added to the turbulence to bang us around. The roar of the boat's diesels reverberated deafeningly in the concrete chamber. Looking upward was like looking out of a deep well; the faces of tourists peering at us over the rim of the lock were so far away they appeared as indistinct patches of white.

A Fast Run for Shore

The ordeal took an hour before we completed rising and the upper gates opened. The pilot of the *Louise* held his boat fast

for us to make our way out. We inched down the corridor, with only a dozen feet of clearance between the barges and the lock wall. As we came into the open we heard the roar of motors behind us as the *Louise* began moving ahead.

We came out on the lake to find that, while we had been waiting, a wind had come up. The lake was running a sea with three-foot waves that threatened to roll us if we tried to traverse the three miles to the harbor. We had to reach shore—and fast.

John held the boat straight until it cleared the last of the training piers that guard the lock, and then swung it at right angles toward shore. The pilot of the *Louise* sensed our difficulty. He turned his searchlight on and laid it ahead of us in a warning. Squarely across our path, barring the shore, was a gravel reef. We changed course and the pilot shifted his light and pinpointed a spot on shore. We followed the light in, pitching so that the prop came up into the air with a wild whirl at each wave, and ended up against a little spit of gravel and rock that gave us a measure of protection against the waves.

Came the Dawn

We sparred the boat off and, dog tired, went to sleep. At 3:45 in the morning, Dorothy shook me awake. The wind had shifted to put the waves broadside to the boat. The craft was grinding on the rocks with a violence that threatened to chew out the bottom in minutes. We got out sounding poles and held it off, hoping daylight would bring an easing of the storm.

Dawn, with the sky heavily overcast, was slow—terribly slow—in coming. When it did and we could see, we felt a little foolish.

Not 50 yards away, a haven of quiet water, was a pleasure-boat harbor.

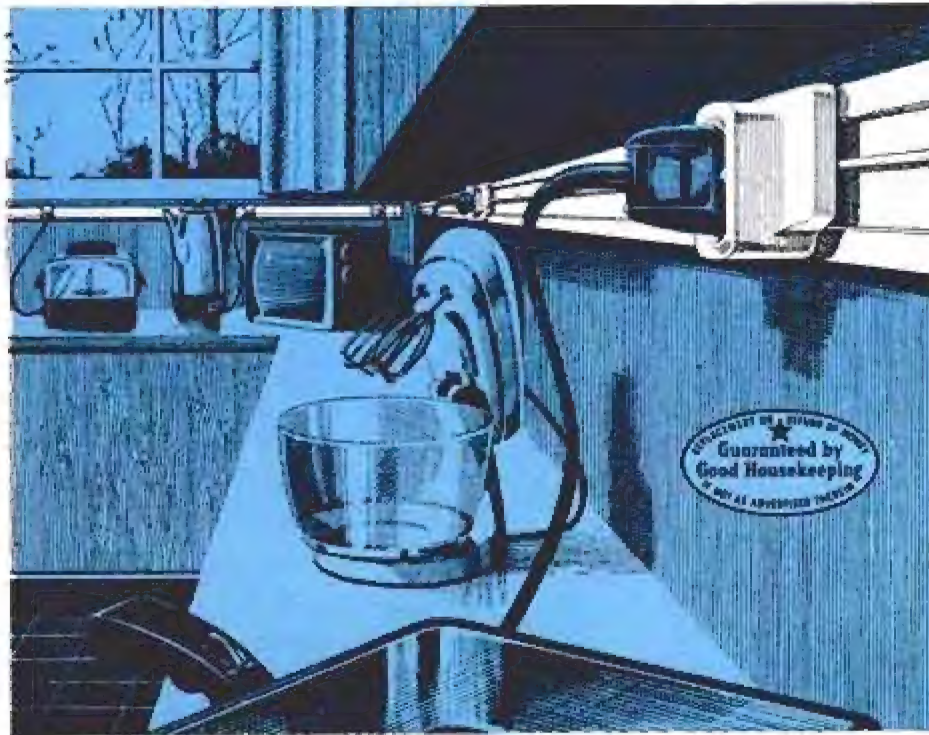
Store Boat for Next Summer

We moved into the harbor and tumbled into the bunks. Later, with time running out, we arranged to store the boat until next year, and another chapter of shanty-boat travel. Our craft, beaten and stained by travel on five rivers, stood in sharp contrast to the gleaming sleekness of the white and chrome cruisers moored in the harbor. As we worked to strip down and button up the boat for storage, we thought we detected amusement in some of the glances sent our way.

If so, we could return them levelly. We had experienced the sweep of the river and the vastness of the night sky. For three weeks we had moved in serenity. We felt renewed and calm and strong. We were rich. All they had was money. ★ ★ ★

Modernize your kitchen electrically

for less than



Twist in outlets anywhere!

Install Electrostrip. It's the easy, *inexpensive* way to bring electrical efficiency and convenience to your kitchen. Electric outlets twist into the strip at any spot—*exactly* where you need them for mixers, blenders, appliances. Electrostrip is ideal in other rooms, too . . . lets you move outlets as you rearrange furniture, lamps and TV.

Available now in a new "do-it-yourself" kit, Electrostrip installs quickly. No breaking into plaster. No complicated connections. It's simple . . . safe . . . listed by Underwriters' Laboratories. Get this flexible outlet system from your hardware or building supply store. BullDog Electric Products Co., Detroit 32, Michigan. In Canada, Toronto 15, Ontario.

© BEPCO

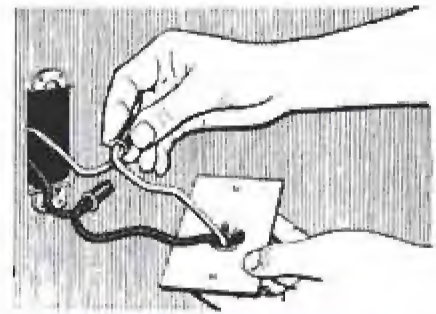
Look for the colorful kit! 15 feet of strip, 4 outlets and fittings with detailed and easy-to-follow installation instructions—complete for only \$9.95. You'll enjoy full **HOUSEPOWER** with Electrostrip.



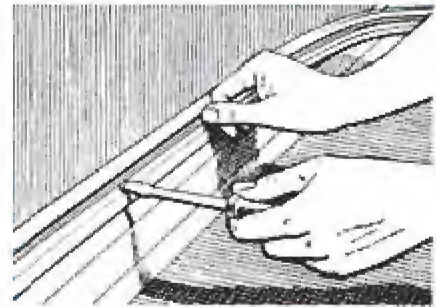
Electrostrip

Made by BullDog Electric Products Co.,
a division of I-T-E Circuit Breaker Co.

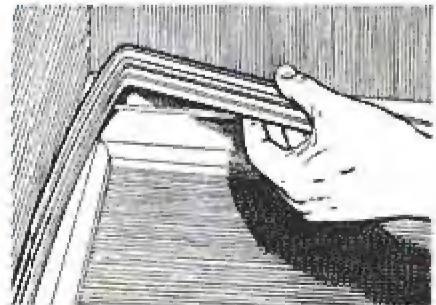
PATENTED



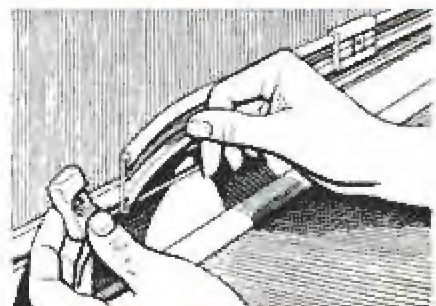
1 Make connection



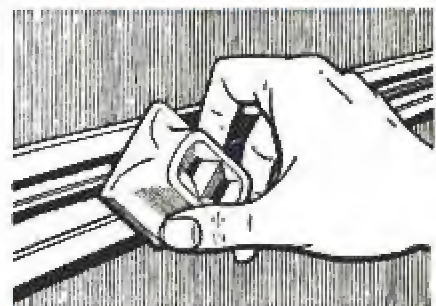
2 Fasten Electrostrip



3 Bend at corners

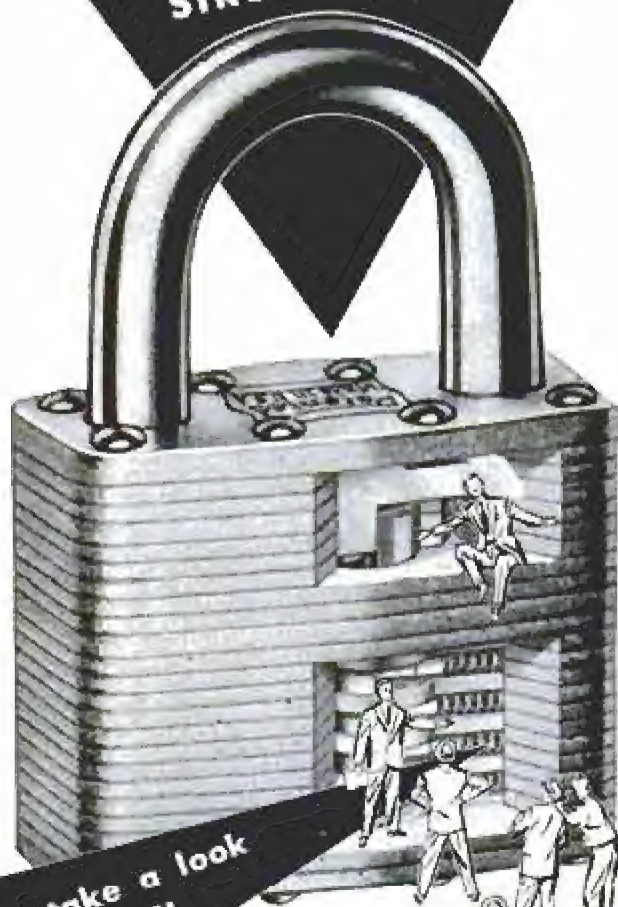


4 Affix end cap



5 Twist in outlets

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Master Padlocks
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STRONGEST



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- Laminated steel case for maximum strength!
- Genuine pin tumbler security!
- Precision-built patented features!
- Available keyed-alike for all your padlock needs!

The best padlock protection you can buy for your property and valuables comes in a laminated steel case with a pin tumbler mechanism — and that's **MASTER Padlocks**, proved the world's strongest, the world over!

\$1.25 to \$4.00, in a variety of sizes, at hardware stores and locksmiths everywhere!

Master Padlocks

ALWAYS ON GUARD

DAY AND NIGHT

MASTER LOCK CO.,

Milwaukee 45, Wis.

World's Largest Padlock Manufacturers

Seagoing Sleuths Probe The Mystery of the Red Tide

(Continued from page 132)

which are inserted in the specially designed quick freezer. In 10 minutes they are frozen solid. Samples to be examined at Naples are put in glass flasks but are not frozen.

The portable quick freezer is the brain child of necessity and the ingenuity of Joe Bell, veteran biologist-oceanographer in charge of the field station.

The quick freezer, built of marine plywood and powered by a ½-horsepower motor which takes the temperature down to a minus 10 degrees, will hold a maximum of 500 vials, normal production for a three-day sampling run and, if electricity should fail, will maintain the temperature for 24 hours as a result of special insulation.

Look at Samples Under Scope

At Naples, the samples are examined under a microscope for a micro-organism, *Gymnodinium brevis*, which studies have shown to be the cause of the red tide. Actually the red tide is neither red nor a tide, but results when the brevis, which are always present and normally inoffensive, reach a concentration of 500,000 per quart of water. Then fish die in a matter of minutes.

Isolating the cause of the fish kill has been the first step in the continuing study. Now the investigation is concentrating upon determining what causes the brevis to attain killing concentrations, and how to break up such concentrations before thousands of fish litter the sea and turn beaches into foul-smelling strips of sand, endangering the tourist trade as well as commercial fishing.

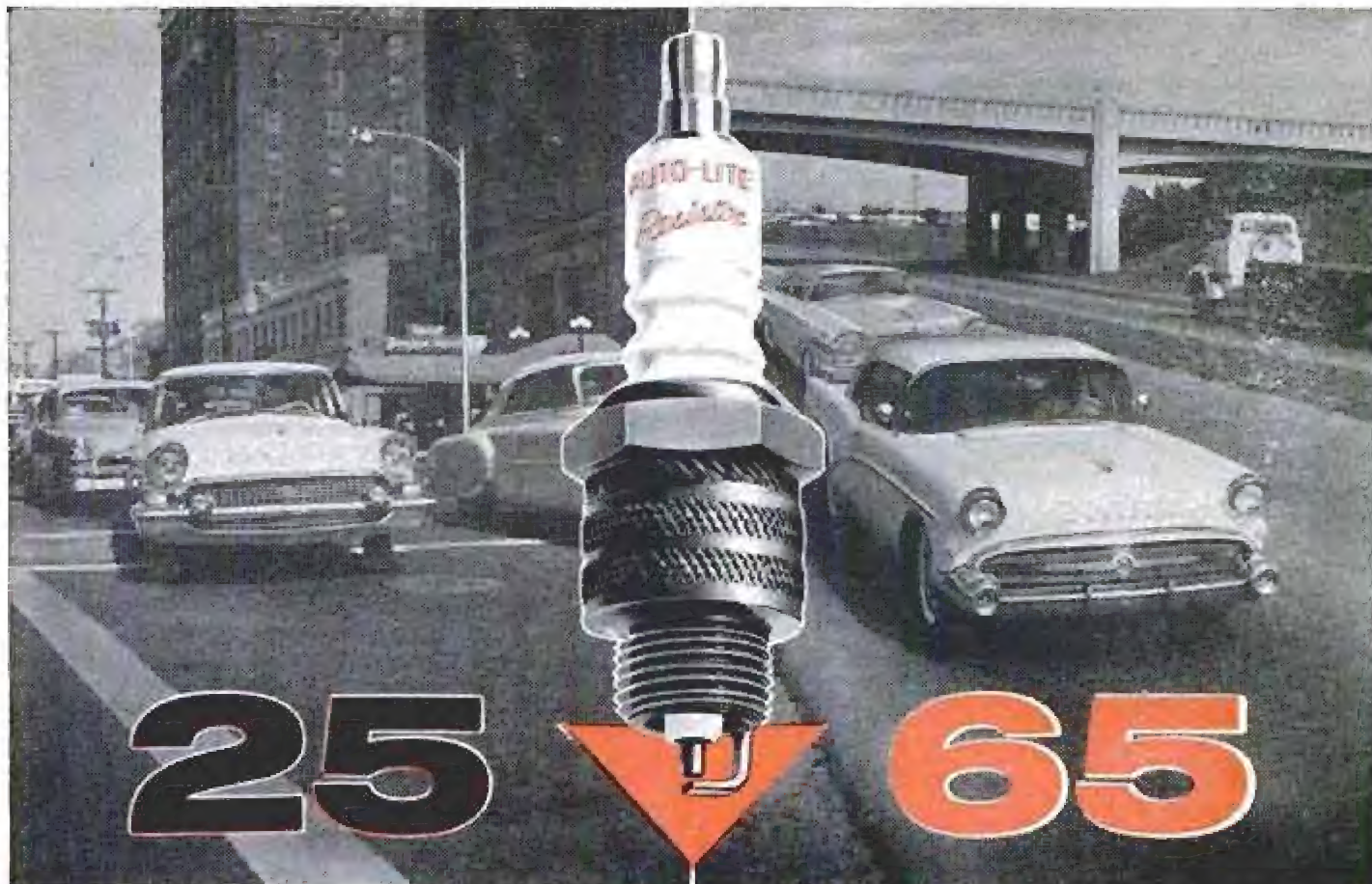
Red Is Greenish-Yellow

Research reveals that the Florida red tide—which is not red since the brevis actually are greenish-yellow in color—has occurred at infrequent intervals for many years. Extreme concentrations of the brevis can cause a reddish reflection from the sun's rays, hence the popular red label.

In the governmental archives, the red-tide detectives found one report of such a kill in the vicinity of Fort Jefferson—the island fortress on Dry Tortugas—in 1878. So bad was the outbreak that the garrison commander had to detail squads of soldiers to bury the dead fish washed ashore. A study of the logs of fishing boats reveals other outbreaks as far back as 1844.

Impetus to the present investigation was supplied by serious outbreaks in 1946 and

(Continued to page 242)



IN TOWN TRAFFIC . . . some spark plugs, designed for high speeds, become fouled and cause misfiring and loss of power when driven at low speeds.

ON THE HIGHWAY . . . some spark plugs, designed for low speeds, misfire causing power loss and invite destructive pre-ignition when driven at high speeds. Why gamble when . . .

Auto-Lite Resistor Spark Plugs with **POWER TIP** "Fire Up" your engine* at all speeds!



If you drive at both town-traffic and highway speeds, here's why you should use Power Tip . . . the first spark plug ignition-engineered for today's engines and today's driving.

YOU CAN SEE
THE BIG NEW
DIFFERENCE IN
SPARK PLUGS!



Ordinary Tip

Power Tip

Power Tip protrudes farther into the combustion chamber for better ignition. Fuel burns more evenly and completely to give top performance and economy at all speeds.

At low speeds, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away *clean*. At higher speeds, the projecting tip is in the path of the incoming air-fuel mixture where it stays cool to *check* power-robbing pre-ignition. Ask your garage or service station to install Auto-Lite . . . the *only* spark plugs with Power Tip . . . and start enjoying top performance and economy from your car at *all speeds*.

*Power Tip, with or without Resistor, is ignition-engineered for overhead-valve V-8 engines and for most overhead-valve 6-cylinder engines in all these cars—Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Edsel, Ford, Hudson, Imperial, Lincoln, Mercury, Oldsmobile, Nash, Packard, Plymouth, Pontiac, Rambler, Studebaker.

AUTO-LITE **POWER TIP**

Auto-Lite makes a complete line of spark plugs, including Standard, Resistor, Small-Engine, Transport, Aircraft, and Diesel-Starting.

1947, when thousands of dead fish were observed floating at sea and washing ashore. Local, state and Federal agencies pooled their resources and established a systematic program to solve the red tide. Another serious outbreak occurred in 1953-54.

Slowly and painstakingly a huge amount of data concerning rainfall at sea and inland, water temperatures and conditions, tides and the intensity of the sun's rays is being collected and tabulated—all aimed at establishing a picture of conditions necessary for a red tide to form.

Study the Tides, Too

And in such investigations, the *Kingfish* plays a vital role in addition to gathering water samples. Ascertaining the exact tidal and current movements along the coast has been one of the most perplexing problems and has caused the development of special instruments.

The *Kingfish*'s radar is used to track specially made floats, so designed that they will move with the tides and currents, yet will be relatively immune to surface winds.

The cruiser is used to track these floats for specific surveys. Three of the floats are placed overboard and their movements plotted every hour by radar during a 24-hour period, thus providing the scientists

with a comprehensive record of the tides and currents in a given area.

Tracking the floats proved to be more difficult than first anticipated. The metal pole proved too small to give a good radar reading, and various devices were tried to improve the radar reception. Every scheme failed until Joe Bell thought of utilizing Christmas foil. This tinsel attached to the floats' masts proved the answer.

Other information collected by the *Kingfish* includes data on the salinity and the acidity of the water.

From laboratory experiments the scientific detectives have ascertained that the brevis will die when subjected to a small quantity of powdered copper sulphate. They feel this may be the answer to checking the red tide, but cannot be certain until a large-scale experiment can be conducted. ★ ★ ★

Bombers to Use Chemical Fuels Now in Design Stage

Two aircraft manufacturers—North American Aviation and Boeing—are understood to be competitively designing a "heavy" bomber that will be powered by a chemical fuel such as boron, lithium, hydrogen peroxide and fluorine compounds, instead of petroleum.

Smoothest motorcycle ever!

NEW

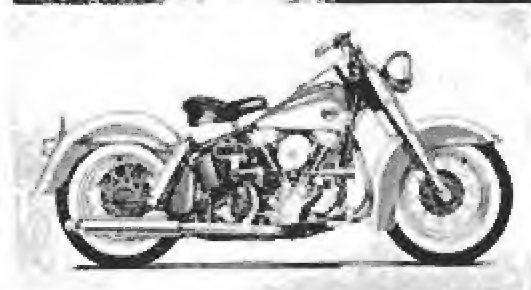
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FOR A NEW CONCEPT OF POWER AND RIDING COMFORT swing aboard the DUO-GLIDE. Sleek and powerful, it's an engineering masterpiece.

New swinging-arm rear suspension coupled with Hydra-Glide front fork and spring-loaded seat post provides unexcelled comfort. Hydraulic rear brake is another Harley-Davidson exclusive. Loaded with other new features too!

Solo or with a buddy, you get a miracle ride on the DUO-GLIDE. Ask your dealer for a test ride and about his liberal trade-in deals, convenient new terms. Or write for free literature.



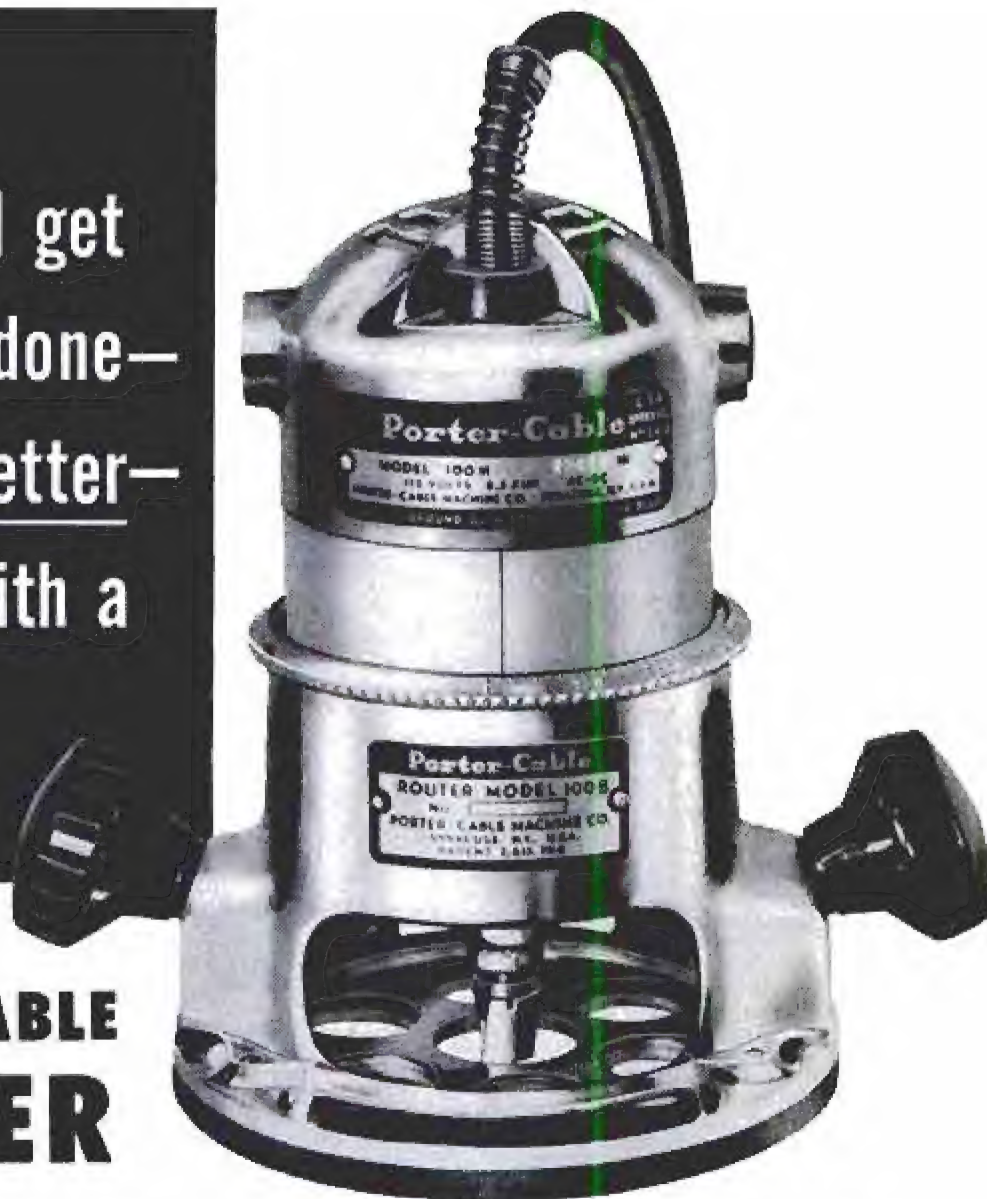
DUO-GLIDE —
absolutely the
finest motorcycle
ever built.

HARLEY-DAVIDSON MOTOR CO.

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you'll get
more jobs done—
 and done better—
 with a

PORTER-CABLE ROUTER



The Porter-Cable Router is one of the most useful woodworking tools you can own. With it you can do all these jobs: make decorative edges on table tops, bookcases and shelving; cut outlines for inlay jobs; grooves and rabbets for cabinet work; mortises for door hinges; circles and ovals—all with perfectly smooth edges and much more.

Illustrated here is the famous Porter-Cable

Router #100, now with full $\frac{7}{8}$ h.p. It is quality built with a non-marking base, precision ball bearings and high-speed, interchangeable motor for Power Plane and Shaper. An outstanding value at only \$57.50. Model #162 $\frac{1}{2}$ h.p. Router, \$49.50.

See these new professional quality tools at your Porter-Cable dealer today or write for full information.

ROUTER BIT KIT

Contains everything you'll need for hundreds of basic Router applications and jobs. Three high-speed bits and sharpening wheel come in hinged transparent case.

No. PR-138Y Bit kit. . . only \$9.95.

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Saws, Drills, Sanders,
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*It's like employing
your own personal mechanic
to keep your engine
always at its best*



The superior lubricating
qualities of Kendall SuperB mean less
wear, less need of repair. Oil and gas mileage
go up. Noise level goes down. Driving
is more economical, more enjoyable with
this All-Weather SAE 10W-30 oil
refined from 100% Bradford Pennsylvania
Crude Oil—richest in the world.

*Ask your favorite dealer
for it now*

KENDALL REFINING COMPANY
BRADFORD, PENNA.

Do Motorboats Scare Fish?

(Continued from page 169)

Pull on a pair of waders and get ready to see more fish in a few minutes than you ever dreamed were there. We are going to use an electrical shocker to stun the fish. The stunned fish can be looked at in hand and then returned to the water. They'll recover in a few minutes and swim away. Here's how we do it. In a boat behind us we float a gasoline-engine electrical generator. Each of us holds a wire-mesh electrode mounted on the end of a rake handle. One electrode is positive, the other negative. Fish are stunned in the field between the submerged electrodes and we dip them up with landing nets as they surface during our walk upstream. With the generator whirring at 4500 revolutions per minute in the boat, we soon have a bushel of fish in our nets. All are taken despite the loud sound of the generator and the splashing and other noise we ourselves make as we move upstream.

Can Fish Hear?

Can a fish hear the racket we made? Certainly—because fundamental hearing parts like those of the human ear are well developed in fish, too. Why didn't the fish scoot away? Why could we shock them within a few feet of our feet? Simply because the noise didn't scare them away.

Now we can go to a lake, carry the shocker in a powerboat, suspend electrodes about eight feet ahead of the bow, motor slowly along, and pick up the temporarily shocked fish. Here we add the noise of an outboard to the whirl of the generator. Together, they certainly sound louder than the outboard alone.

Noise Audible for a Mile

Want to get an idea of what a fish hears when a powerboat goes by? We'll jump into four feet of water off the end of our dock and let my son speed away from us with a 35-horsepower outboard. A loud singing sizzle will gradually fade to a whisper. The whisper will still be audible when he has gone nearly a mile away. Both propeller and underwater exhaust contribute to the sound we hear.

And while we were making this observation, with all its commotion, the neighbor kids on a dock not 20 feet away kept right on catching crappies, bluegills, pumpkin seeds and rock bass! This lack of fear of engine sounds has been witnessed on many occasions. The fish keep right on biting. Scientists working under water with diving gear have been amazed at the lack of

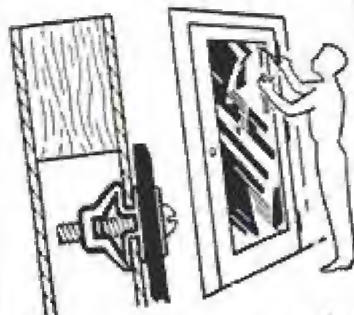
(Continued to page 246)

NOW...

Hang Fixtures Securely On Hollow-Core Flush Doors!

MOLLY

JACK NUT



At last you can hang mirrors, racks, shelves, kickplates, etc., securely on wood or metal hollow-core flush doors. Only $\frac{3}{8}$ " expansion space required. And the weight Jack Nuts will hold is limited only by the strength of the door.

Ask Your Hardware Man for Molly JACK NUTS

WRITE FOR FREE LITERATURE



MOLLY
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SIZE OF 45



WORKS IN EXPANSION
SPACE AS SMALL AS $\frac{3}{8}$ "

...gives permanent anchorage, cannot pull through. Fixtures can be removed and replaced in same nut. Neal in appearance. Will not disfigure door or mar finish. Jack Nuts grip any material from 0" to $\frac{3}{4}$ " thick. As easy to install as A-B-C:



A
DRILL HOLE AND
INSERT JACK NUT.



B
RUN IN SCREW UNTIL
IT TURNS FAIRLY HARD.



C
FIXTURE CAN BE
REMOVED AND REPLACED
IN SAME NUT.

- Only $\frac{1}{2}$ the size of the next smallest hollow wall fastener on the market.
- By the makers of famous Molly Screw Anchors.



NEW WAY TO CUT PERFECT GROOVES WITH CIRCLE SAW!

Just dial any of 40 cuts. Parallel, clean, no sanding! Leave on saw for regular cuts. For $\frac{1}{2}$, $\frac{3}{8}$, $\frac{3}{4}$ and 1" arbors. At dealer's or order direct! Send for free booklet

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per set

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Now! Pre-assembled kits save up to $\frac{2}{3}$ assembly time. Send for Free Catalog Now! Cruisers, Runabouts. 12 NEW Models 12-18'. Supermart selection of Fiberglass & Accessories.

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America's Finest Cultivator at anywhere near its small price!

Hummin'bird
ROTO-HOE

only
'109.50
complete



Now you can no longer afford to do hard spade and hoe work. This powerful (2½ h.p.) self-propelled tiller-cultivator makes gardening a pleasure! Has a beautiful self-propelled 22" twin-spindle rotary mower attachment you can hook on in seconds—for just \$44.50; and the Safe-Speed Edger for only \$27.50. Write today for free folder and nearest dealer's name.

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PAINTING TIP NO. 42



Make professional-looking stripes with "SCOTCH" Brand Masking Tape. Stretchy tape sticks tight, hugs curved surfaces. Paint will not bleed through. After paint has "set", "SCOTCH" Masking Tape strips off easily, leaving a clean, sharp edge. Makes painting quicker, neater with brush, roller or spray. Get "SCOTCH" Brand in the handy cutter-edge carton—35¢, 69¢, 98¢, \$1.69—wherever paint is sold.

Don't run short... BETTER BUY TWO!

Made by
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Now! A lightweight chain saw for heavyweight cutting!



New Black & Decker Chain Saw Attachment plus Black & Decker Saw brings you cleaner, faster, easier chain sawing!

Talk about versatility! With this new Black & Decker Chain Saw Attachment, you can buck, fell, limb, trim, notch quickly and easily! Quick, because this attachment is powered by the famous Black & Decker Saw motor. Easy, because it's so light.

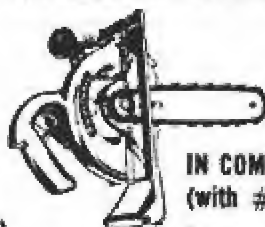
And it's even more versatile because you can convert right back to a full-powered circular saw for dozens of other sawing jobs! Even if you only do occasional chain sawing, it will pay you to get this money-saving combination of a B&D Saw and Chain Saw Attachment. See your dealer now! The Black & Decker Mfg. Co., Dept. M-038, Towson 4, Md. (In Canada: P.O. Box 278, Brockville, Ont.)

YOU CAN PURCHASE THE B&D CHAIN SAW ATTACHMENT:



BY ITSELF (for your present B&D #73 or #83 Saw)

Cast aluminum; teeth grip wood while cutting. Handles trees up to 18" diameter.



IN COMBINATION (with #73 Saw)

2 saws in 1, at attractive saving! Converts from saw to chain saw in minutes. Weighs 14½ lbs!

Black & Decker®



World's Largest Maker of Electric Tools

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concern that fish show over surface sounds and motorboat noises.

Let's wigwag Karl, Jr., back to the dock and take a run with him. Now we swing out of the lake into the Huron River. Motorboat traffic picks up considerably. And there, on a river bend 50 feet from the traffic lane, is an anchored boat with two guys and a gal, still-fishing. They glower at us as our wash rocks their boat, but keep right on fishing. Two hours and a hundred boat-passes later, we stop to see if they've caught anything. The stringer comes up and on it are 37 of the nicest bluegills! The boats didn't put the fish down; the fish appear to have kept right on biting although they were never out of sound of a motor. If some were scared by the motors, it was not enough to keep our anglers from making a good catch.

Use Motors for Trolling

Now let's get up early in the morning and troll for walleyes or for muskies. There was a day when we'd row to do this. But now we just throttle the engine down to a slow put-put-put and troll. The result: fine fishing. As a matter of fact, the only times that powerboats are not used for trolling is when trolling with power is too successful for the good of the fish stock. Only a few states have laws that prohibit the use of motors for trolling. The rest either have repealed them or never had them at all. Good and well-tried advice to fishermen is "when in doubt, troll."

On occasion, I take a short fishing holiday with my graduate students. One of them, now a fish scientist, used to be a guide in New England. He told me of a way that outboards are used to make fish bite. In some of the trout rivers of Maine, the guide will nose the motorboat into the bank and then race the engine in gear. This is a noisy procedure and churns up a great cloud of mud from the bottom. Then the boat is pushed off and trout are taken around the edge of the cloud!

Outboard Helps Trout Fishing

On opening day of trout season one year, I fished the main stream of the Au Sable River in Michigan. Two fish doctors-to-be were with me. But even for experts, fishing was slow. Then a lad with an outboard ran up stream. "Good time to get out for a smoke," I said to my boys as I waded ashore. I'd no sooner lighted up than the boys each landed a trout. After the outboarding lad had gone upstream for the third time (after fishing back down), each time providing a little bump to the fishing, it dawned on me that here was something

that looked like a cause-and-effect relationship. This is slim evidence, I know, but the only brook and rainbow trout that we had for supper were taken in the few-minute intervals following each of the boy's upstream passes with his kicker.

Convinced by the foregoing that fish are not scared away by motor sounds, we wondered whether or not the noise would keep the fish from biting. With funds from the Outboard Boating Club of America, my colleague, Dr. Hazzard, and I hired a team of fishermen and a motorboat operator for an experiment. We found a 40-acre lake with a good population of sunfish and went to work. Daily each of the three fishermen chose a fishing spot at random. He would anchor his boat there and fish for the day, rain or shine, windy or calm, hot or cold. Worms were used as bait and all fishing was still-fishing. On alternate days a five-horsepower outboard on a 12-foot rowboat rumbled by each fisherman every 15 minutes, all day long. There was no such disturbance on alternate days. No other motorboats were allowed on the lake during the experiment. At the end of 66 days, 33 of motor use and 33 without, the catch was essentially the same for both kinds of days. The three-man crew actually caught an average of $\frac{1}{10}$ fish more per hour on nonmotor days than on motor-use ones! Statistical treatment of the data led to the conclusion that the observed difference was not significant, and by sheer chance could have been as great or greater in the opposite direction.

Thus there is no technical evidence at hand that would condemn motorboating from the fish-eye point of view. The real concern is with the relationship of the boater and the angler. Each wants to protect his sport. They can do it in a truly democratic manner by recognizing that each has his rights. Common courtesy and consideration by all concerned will save the sports of both. ★ ★ ★

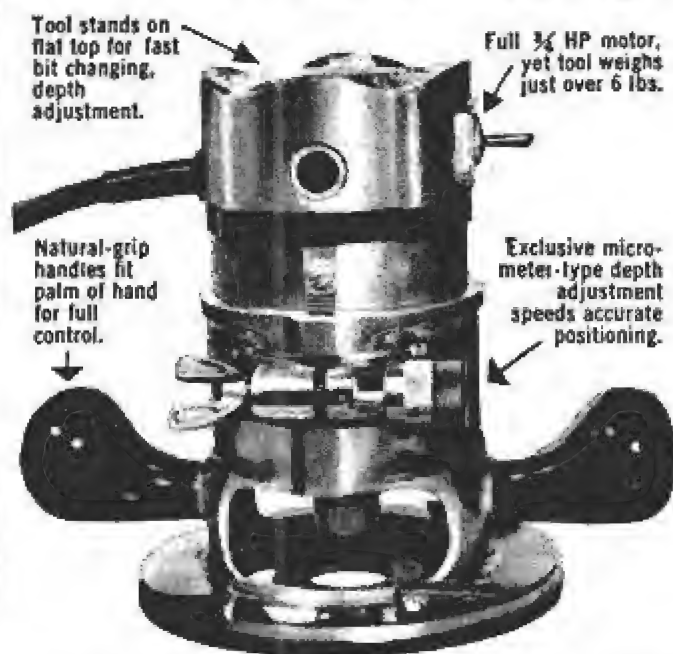
Weather Planes Fly World-Wide

Reconnaissance airplanes of the U. S. Air Force Weather Service fly 35,000 miles each day, for a total of more than 12 million miles per year, gathering weather data in vital areas throughout the world where it is not otherwise available.

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Major outbursts of the sun may release in 20 minutes energy equal to the explosion of a billion of the largest known hydrogen bombs, according to Prof. John A. Simpson of the Enrico Fermi Institute for Nuclear Studies, University of Chicago.

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He Flies Kites for Love or Money

(Continued from page 86)

or boat crew and be seen for miles by searchers.

The bright-yellow cloth cylinder (nylon coated with rubber) stands eight feet high and is 3½ feet in diameter. Weighted at the open end, it traps air inside upon contact with the water's surface, then floats away gracefully before the breeze.

Markers Could Bring Help

"In an emergency, or even should a vessel or airplane sight a floating hazard to navigation, such a marker could bring the Coast Guard quickly to the scene," Dom says. "All that the radio message to the searchers need tell would be the latitude and longitude where the marker was thrown over, the speed and direction of the surface wind. It will remain afloat for a month or more."

Circus performers and high divers place their lives in his hands when they ask him to design rubber tanks and other special equipment. He numbers among his clients Sol Solomon, acrobatic diver who has employed a Jalbert collapsible water tank made of nylon with Neoprene "welds." Only 15 feet in diameter and 7 feet deep, the tank safely stopped the daredevil aerialist's dive from 120 feet.

While the author was interviewing the inventor, a pair of California yachtsmen dropped in to inquire if Jalbert would design an ocean-racing sail which the wind could not rip. They'd already lost several sails made of three and four-ounce material.

Designs Lightweight Sail

After studying their plans Dom startled the sportsmen by declaring he would build them a sail from one-ounce material that would have the strength of ordinary seven-ounce fabric. "What's more, if it rips you won't have to pay for it," he concluded.

Jalbert's latest invention deals with such wind-pressured cloth and promises to become one of his most important contributions. It is a "multicell" parachute, made of rip-stop nylon, and he has designed it in both circular and square form. These chutes are the first of their kind and are patented.

"They consist of many small chutes put together to form one big chute," he explains. "For the same weight in an ordinary parachute, this will carry 35 to 40 percent more load. And it will be about 40 percent safer, too. It will not rip, and it costs from 15 to 18 percent less to build than the conventional chute."

(Continued to page 250)

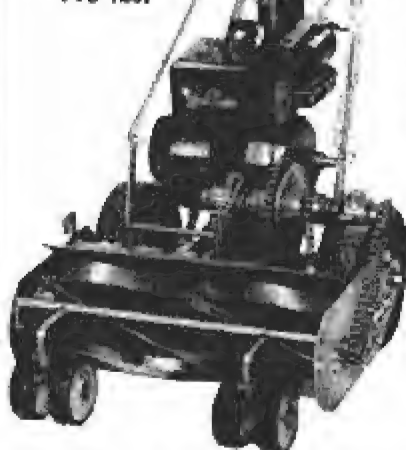
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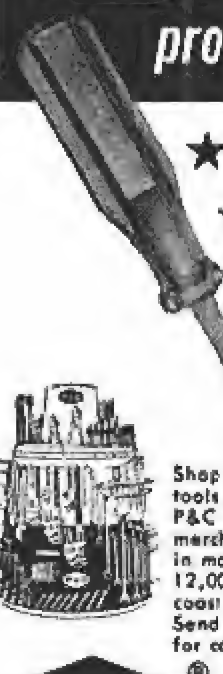
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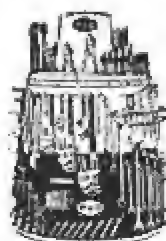
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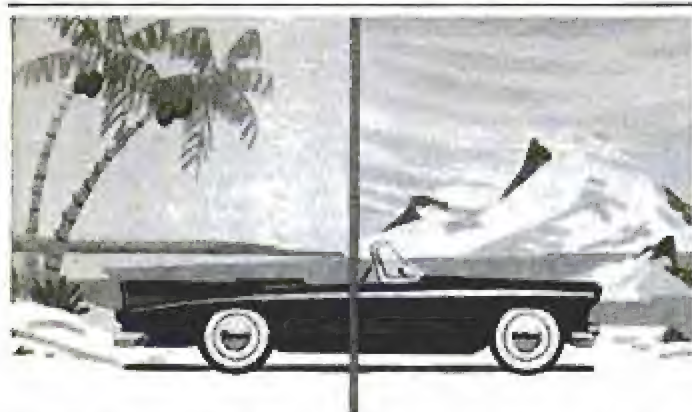
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The new canopy will not "Roman candle" (split from skirt to apex, thereby spilling out its air). In fact, when the enthusiastic inventor had nationally known jumper Lew Sanborn first test the two multicell creations, the two men purposely ripped out several cells.

Sanborn jumped at 6000 feet and purposely fell free for 2000 feet before yanking the rip cord. Instead of permitting air to rush to the top of the canopy, as does the ordinary chute, the multicell design traps air at the skirt edge first, after which the rest of the area is filled.

Jalbert Explains Square Chute

Jalbert explains the justification for the square chute in this manner: "If you put two circles side by side, with their rims together, the area where they touch will be very small. However, if you put two squares side by side, the drag coefficient of this combination is about one third more than the first. Hence, two square chutes will be as effective as three round chutes and you have thereby saved the cost of one extra chute, one extra rigging and one extra packing."

Dom Jalbert regards it a shame that today's kids "cannot buy a low-cost kite which will fly at a high angle above the horizon, with little catenary in the line to send it crashing into the trees."

To this day he is kidded for flying kites, and he shakes his head over this attitude of the average adult. "They wouldn't make fun of me if I spent my money on expensive rods and reels and traveled hundreds of miles in the hope of catching a fish," he observes, eyes twinkling. "Yet I could have every bit as exciting a battle simply by staying home and flying an inexpensive kite at the end of a fishing line from my backyard. At least, I would be sure of having something hooked!" ★ ★ ★

Solid-Boron Propellant Boosts Rocket Efficiency

More efficient rockets are promised by development of a solid boron-carbon-hydrogen compound as a rocket fuel. Rockets using the new fuel will have less weight and be less complicated because they will not have to carry fuel-transfer pumps. The boron fuel also will permit air-breathing engines to operate at higher altitudes than would be possible with conventional fuels.

☞ Cows in the University of Wyoming dairy herd carry magnets in their stomachs as part of a study of "hardware disease," an ailment found in cattle that swallow wire, nails and other bits of metal.

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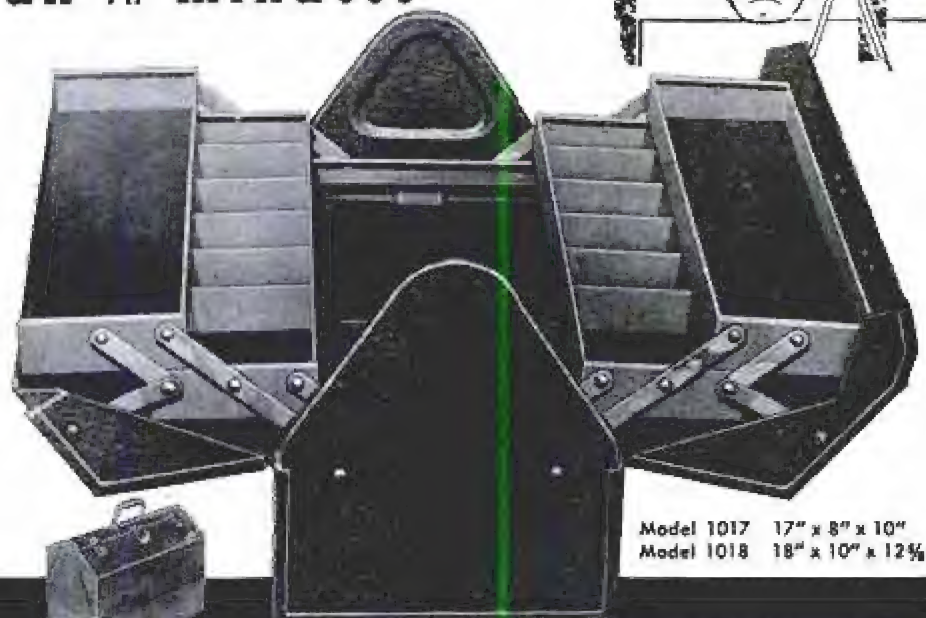
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The width of the cutout can be increased or lessened according to the size and number of outboard motors to be used. The $\frac{3}{4}$ -in. motor board is coated with glue and fastened into position with $1\frac{1}{2}$ -in. No. 8 screws spaced 6 in. apart.

Stem: The stem is laid out full size directly on plywood according to the dimensions given in Fig. 8. It is fabricated from two layers of $\frac{3}{4}$ -in. plywood. Coat the mating surfaces liberally with glue and screw the pieces together.

Breasthook: The breasthook is made up of two layers of $\frac{3}{4}$ -in. plywood as detailed in Fig. 8. Note that a notch is provided in the bottom half to accept the stemhead.

Chine blocking: The chine blocking simplifies fitting of the chine to the stem at the proper point and angle. It is laid out on $\frac{3}{4}$ -in. plywood as detailed in Fig. 8. The parts are assembled with glue and

nails or screws. After assembly the forward edges are cut to 38-deg. angles as shown.

Transom knees: Three transom knees are required, one of which is fabricated from three layers of $\frac{3}{4}$ -in. plywood and bolted to the keel and transom, Fig. 7. The other two are cut from $\frac{3}{8}$ -in. plywood and screwed to the outer battens and transom.

Building form: The builder is advised not to skimp or attempt to use warped or otherwise unsuitable lumber when constructing the building form. This form will govern the entire shape of the boat. To insure an accurately built hull, the base member of the building form should be made rigidly and securely anchored to a wooden floor, concrete slab or any other fairly smooth and level surface, including the ground, Fig. 10. After the base member

(Continued to page 254)

MATERIALS LIST

All lumber listed should be first grade free from shakes and knots. Lumber designated as 1 in. thick should be "four quarters" material finished as full as possible ($\frac{3}{4}$ in. to $\frac{7}{8}$ in.). All other thicknesses are listed net. All widths are actual dimensions. All lengths allow material for cutting to fit. All plywood must be exterior type, marine grade, with solid core suggested for stressed areas. Plywood panels $\frac{1}{4}$ in. thick are three ply, $\frac{3}{8}$ -in. panels 5 ply and anything over $\frac{3}{8}$ in. a minimum of 5 plys. It is suggested that the builder group his lumber so as to obtain random width material for ripping to the desired widths, rather than obtain the exact sizes shown. This will produce a substantial saving.

Key to materials list: DFP—Douglas fir plywood, AB, exterior grade, AA, marine grade; MP—Mahogany plywood, marine or exterior grade; Oak—White oak lumber; M—Mahogany lumber; S—Spruce lumber.

Item	Material	Quan.	Size
Frames and transom frame	O, M, or S	40	random bd. ft.
Gussets and keel laminations	DFP	1	$3\frac{1}{2}$ "x4"x8"
Transom, stem, chine blocking, breasthook and tail-fin sheers	DFP	1	$3\frac{1}{2}$ "x4"x8"
Floorboards	DFP	2	$3\frac{1}{2}$ "x4"x8"
Seat brackets and fin sheers	DFP	1	$3\frac{1}{2}$ "x4"x8"
Seat backs and base	DFP	2	$3\frac{1}{2}$ "x3"x6"
Decking	MP	2	$1\frac{1}{2}$ "x4"x8"
Bottom planking	AA-DFP	2	$1\frac{1}{2}$ "x3"x14"
Side planking	AA-DFP	2	$1\frac{1}{2}$ "x3"x16"
Keel	O, M, or S	1	$1\frac{1}{2}$ "x4"x12"
Battens	O, M, or S	2	$1\frac{1}{2}$ "x3"x12"
Battens	O, M, or S	2	$1\frac{1}{2}$ "x3"x10"
Chine log	O, M, or S	2	$1\frac{1}{2}$ "x2"x15"
Sheer clamp	O, M, or S	4	$3\frac{1}{2}$ "x1"x16"
Carlings	O, M, or S	2	$1\frac{1}{2}$ "x5"x10"
After-deck beams	M	2	$1\frac{1}{2}$ "x6"x5"
Dash beam	M	1	$1\frac{1}{2}$ "x6"x6" 4"
Forward-deck beam	O, M, or S	1	$1\frac{1}{2}$ "x4"x4" 6"
Strongback	O, M, or S	1	$1\frac{1}{2}$ "x3"x8"
Deck battens	O, M, or S	2	$1\frac{1}{2}$ "x2"x5"
Motor-well sides	M or $\frac{3}{4}$ " P	2	$1\frac{1}{2}$ "x9"x2"
Floor battens	O, M, or S	2	$1\frac{1}{2}$ "x2"x8"
Tail-fin blocking	M	2	$2\frac{1}{2}$ "x6"x24"
Bumper rail	M	2	$1\frac{1}{2}$ "x2"x8"
Misc. blocking	O, M, or S	as reqd.	
FASTENINGS:			
Screws, F.H.	bronze or galv.	2 doz.	3" No. 14
Screws, F.H.	bronze or galv.	1 gross	2" No. 10
Screws, F.H.	bronze or galv.	1 gross	$1\frac{1}{2}$ " No. 8
Screws, F.H.	bronze or galv.	1 gross	$1\frac{1}{2}$ " No. 8
Screws, F.H.	bronze or galv.	6 gross	1" No. 8
Nails, annular-ring type	monel	2 lbs.	$1\frac{1}{2}$ "
Nails, annular-ring type	monel	3 lbs.	1"
Bolts, carriage with washers	galv.	6	$\frac{5}{8}$ "x5" 1"
Glue	plastic resin	7 lbs.	or equivalent amount of resorcinol glue

FASTENING SCHEDULE

Members	Type	Size	Spacing
Gussets to frames	nails	$1\frac{1}{2}$ "	5 ea. member
Floor timbers to frames	screws	$1\frac{1}{2}$ " No. 8	4 ea. member
Transom frame to transom	screws	$1\frac{1}{2}$ " No. 8	6" apart
Stem laminations	screws	$1\frac{1}{2}$ " No. 8	6" apart
Breasthook laminations	screws	$1\frac{1}{2}$ " No. 8	8 reqd.
Chine-blocking laminations	screws	$1\frac{1}{2}$ " No. 8	8 reqd.
Transom-knee laminations	screws	$1\frac{1}{2}$ " No. 8	8 reqd.
Breasthook to stem	screws	2" No. 10	2 reqd.
Stem to frame 4	screws	2" No. 10	3 reqd.
Chine blocking to stem	screws	2" No. 10	2 reqd.
Keel to stem	bolts	$5/16$ "	2 reqd.
Knee to keel and transom	bolts	$5/16$ "	4 reqd.
Keel to frames	screws	2" No. 10	2 ea. joint
Plywood strip to keel	nails	1"	4" apart
Knee to transom and battens	screws	1" No. 8	3" apart
Battens to frames	screws	2" No. 10	1 ea. joint
Chine log to frames, etc.	screws	2" No. 10	1 ea. joint
Sheer clamp to frames, etc.	screws	2" No. 10	1 ea. joint
Planking to sheer clamp	screws	1" No. 8	4" apart
Planking to chine log and keel	screws	1" No. 8	3" apart
Planking to battens	screws	1" No. 8	4" apart
Planking to frames	screws	1" No. 8	4" apart
Planking to stem and transom	screws	$1\frac{1}{2}$ " No. 8	2" apart
Outer keel to hull	screws	2" No. 10	6" apart
Stem-cap strip to hull	screws	$1\frac{1}{2}$ " No. 8	12" apart
Spray rail to hull	screws	2" No. 10	12" apart
Carling to frames	screws	2" No. 10	2 ea.
Intermediate deck beam	screws	2" No. 10	2 ea. end
Deck framing	screws	2" No. 10	2 ea. joint
Deck battens to beams	screws	2" No. 10	1 ea. joint
Strongback to beams and breasthook	screws	2" No. 10	1 ea. joint
Decking all outer edges	nails	1"	2" apart
Decking all other points	nails	1"	4" apart

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is anchored, legs are constructed to support the longitudinal setup members which must be level lengthwise and athwartships. Also, it is very important that the height from the top of the breasthook to the setup level be exactly 24 in. The frames are mounted bottom-side-up and spaced as shown. Be sure to space the frames accurately and anchor them rigidly to the form with clamps or screws. If the setup members of the form are level, a carpenter's square and level may be used to plumb the frames.

The chine blocking and breasthook can now be assembled to the stem. The heel of the stem is then slipped into the slot between the bottom frame members of frame 4, butted to the floor timber and screwed



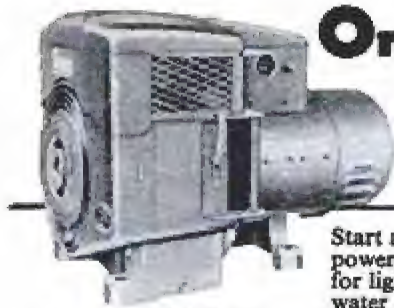
Frame members requiring flat surfaces are checked with straightedge and ridges removed with plane

to it. The breasthook should be securely fastened to the blocking to prevent movement during construction.

The transom is aligned in place and angled 12 deg. from the setup level, plus 90 deg. Simply insert shims between the building form and the transom frame until the transom has been brought to the proper height. This is to assure that the keel is straight from the transom to frame 3. After aligning the entire assembly on the form, anchor the members in position and brace them rigidly to prevent movement, especially when springing the curved longitudinals into place. Considerable stress is placed on the form when doing this.

Keel: The keel is a single length of 1 x 4-in. oak or mahogany with a $\frac{3}{8}$ x 4-in. plywood strip glued and nailed to the inner face to prevent splitting of the keel. The

(Continued to page 256)



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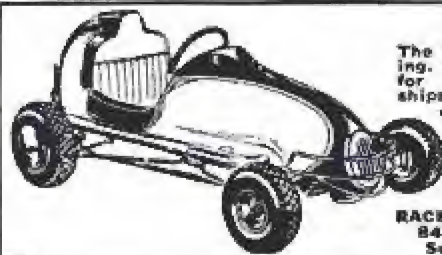
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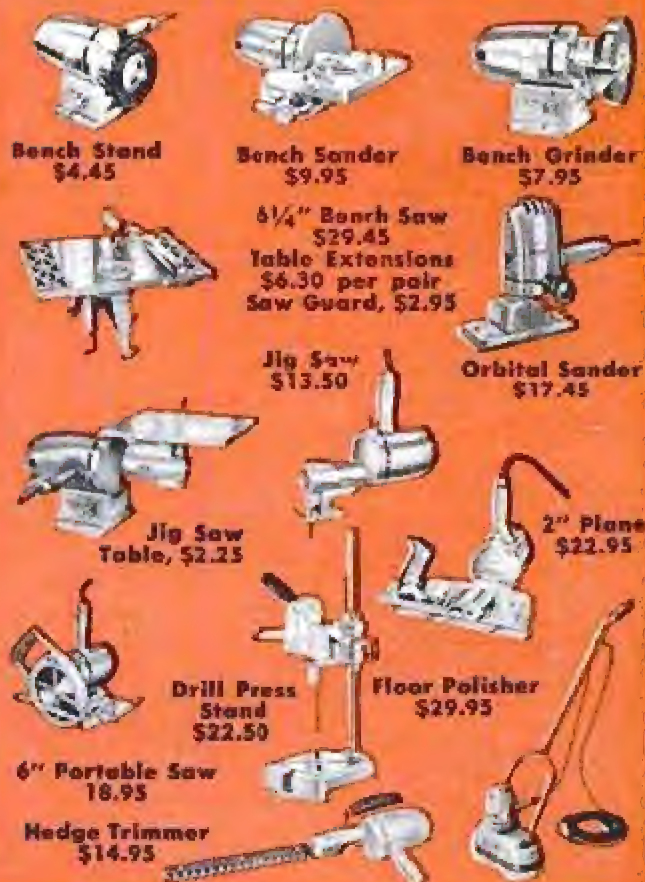
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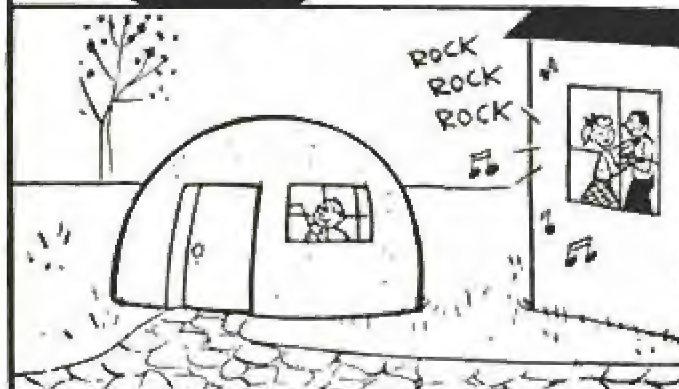
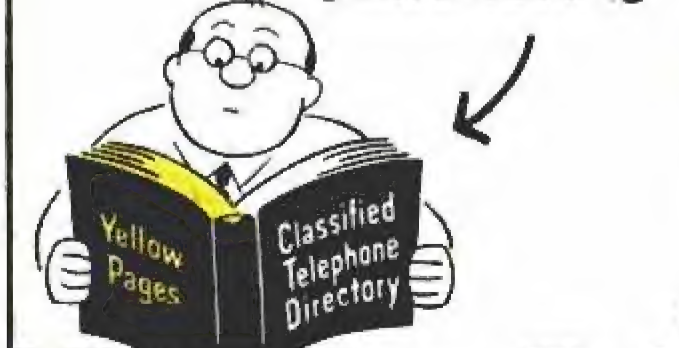
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keel is glued and screwed to the frames and transom. Countersink the screws $\frac{1}{4}$ in. Also, the keel is bolted to the stem with two $\frac{3}{16}$ -in. carriage bolts with the heads of the bolts countersunk below the surface.

Chine log: The junction of the side planking and bottom planking is the chine point or line and backing member is called the chine log or member. The chine log is cut in a single length from 1 x 2 $\frac{1}{4}$ -in. mahogany or oak. This is fitted into the notch at the transom and sprung around the notches in the frames. The notches in the frames must

To Save Both Time and Work

If you wish, you can buy patterns for the stem, frames, transom, breasthook and chine blocking already drawn full size. And, to further simplify construction, you can buy these parts in kit form accurately cut in mahogany from Glen-L Marine Designs, 9152 E. Rosecrans, Bellflower, Calif.

be beveled up forward so that the chine log will lie flat against the frames. Bevel the chine log to fit against the stem at the chine blocking. Coat the notches with glue and fasten with a single 2-in. No. 10 screw at each frame and at the transom. Fasten it to the chine blocking with several 2-in. No. 10 screws. The same operation should be performed on the other side simultaneously to equalize the stress.

Sheer clamp: The sheer clamp is built up from two thicknesses of $\frac{5}{8}$ x 1 $\frac{1}{4}$ -in. mahogany or spruce in single lengths. The notches for the sheer clamp must be beveled similarly to the chine log. Spring the first lamination of the sheer clamp around and nail it to each member. The second layer is then coated with glue and laminated to the first. Screw both layers to

Blueprints Available

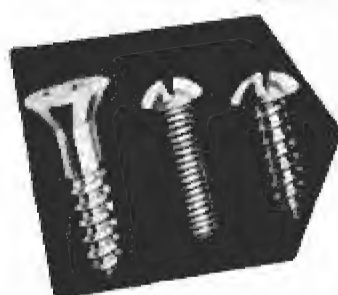
Those who prefer to build *Swish* from plans larger than the ones presented in the magazine may purchase a set of blueprints, 17 x 34 in., by writing Blueprint Department, *Popular Mechanics Magazine*, 200 E. Ontario St., Chicago 11.

the frames, transom and breasthook. The laminations should be held together with clamps until the glue has set as in Fig. 11. The builder will note that the sheer clamp is set in vertically from amidships forward. No attempt should be made to twist the sheer clamp to conform to the contour of the side planking.

(To be continued)

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Radio Aids to Carefree Cruising

(Continued from page 223)

in case of emergency, can sometimes spell the difference between just another adventure and—tragedy. To this end, nothing will do more to insure carefree cruising than a reliable radiotelephone.

Until recently, equipment of this type was priced out of reach of most pleasure-craft owners, but times have changed. Now, some radiotelephones can be purchased for less than \$300; a relatively small cost considering the peace of mind and convenience they afford. For, while safety at sea is the primary purpose of such units, they also permit instant communications with relatives, friends and business associates even though you are surrounded by miles of water.

Typical low-cost radiotelephones are illustrated in Fig. 6. Basically, these consist of a combination receiver-transmitter, an antenna and a power pack. The receiver usually covers the broadcast band plus five or more fixed marine-radio channels. The transmitter is pretuned to frequencies complementary to the receiving channels. Both units are crystal controlled to prevent frequency drift and assure reliable performance. A channel selector permits simultaneous switching of receiver and

transmitter to the desired channel. To operate, simply select the desired channel, press the button on the associated microphone, and you are ready to transmit. Release the button and the receiver is automatically placed in operation on the complementary receiving frequency.

Why five or more ship's channels? To answer this question you need only realize that radio channels, unlike land telephone lines, can handle only one conversation at a time. Now look at the map in Fig. 5, which shows the locations of shore telephone stations, and try to imagine the chaos which would result if all boats in a congested area would try to contact a land station or each other on the same frequency.

To handle the flow of communications and minimize interference, many shore stations have been assigned two or more frequencies. Furthermore, some marine band frequencies are used only for the purpose of establishing contact between stations (calling frequencies), while others are used to actually carry on the conversation (working frequencies). And, in addition, the frequencies designated to handle ship-to-ship traffic are usually different from those established for ship-to-shore messages. It is easy to see, therefore, why the radiotelephone must be able to cover

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a number of frequencies for reliable performance in various regions. Commercial equipment is designed so that the desired channels can be obtained by selecting and installing the correct set of crystals.

Monitor Distress Frequency

When a radiotelephone is in operation and conversation is not in progress on other frequencies, it is required by law that the international distress frequency be monitored. To make this convenient, this frequency (2182 kc.) has also been chosen as the international calling frequency. Most communications originate on this channel before being transferred to the regular working frequency of the area in question. This regulation does much to increase the speed with which aid can be rushed to an imperiled mariner. Since most radio-equipped boats will be tuned to the distress frequency, a call for help will often be answered long before the Coast Guard can arrive on the scene.

Transmitter power. Reliable operation of a radiotelephone depends primarily on the range of the transmitter aboard ship. It is of little use merely to be able to hear the powerful coastal stations unless these can also pick up your calls. The proper choice of transmitter power rating, therefore, is a very important one. The exact

range of a transmitter is difficult to determine because it depends on many variables such as atmospheric conditions, time of day and year, frequencies used, etc., but it is conservatively estimated at approximately 1½ miles per watt of transmitter power input for fresh-water operation. Salt-water conditions may increase this range as much as 100 percent.

FCC regulations set the minimum power limits for marine-radio transmitters at 15 watts but, beyond that, your requirements are determined by the distance you wish to cover. A good rule is—buy all the power you need, but no more than you expect to use. For, not only do costs increase proportionally to transmitter power, but excessive range can cause serious interference by tying up channels in areas far beyond your own required range.

Licensing. Any citizen of the U.S., over 18 years old, can obtain a station license simply by filling out forms usually supplied when the equipment is purchased. An operator's permit may be obtained after passing a brief, nontechnical written examination given at a local FCC office. ★★★

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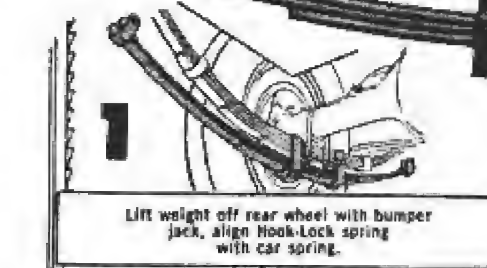


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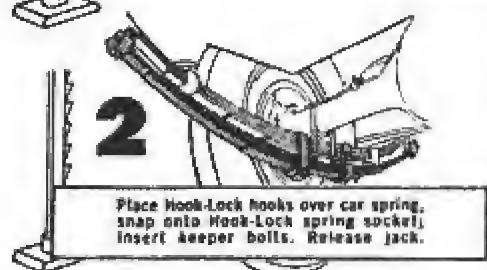
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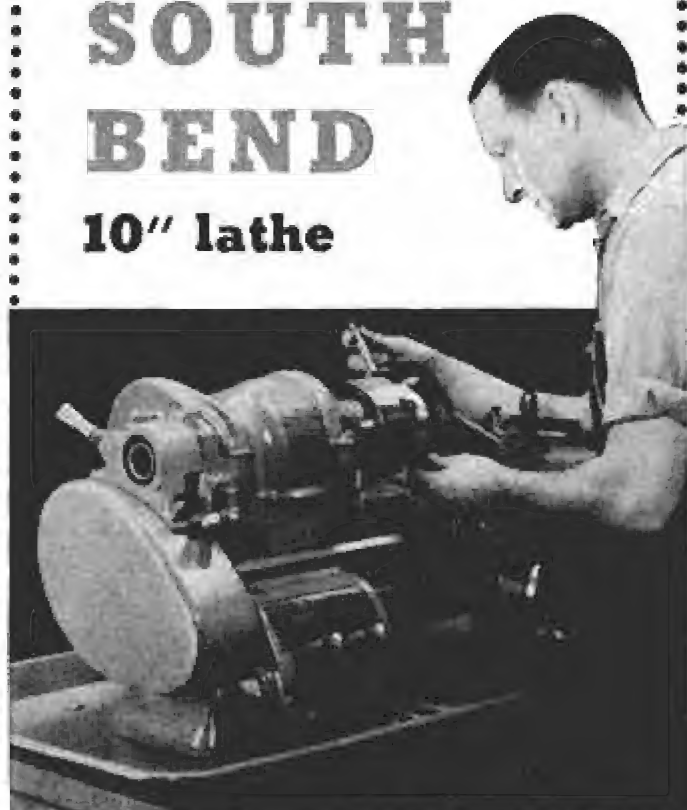
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Growing More Meat With Antibiotics

(Continued from page 127)

same broiler is ready in eight to nine weeks on 7½ pounds of antibiotic-supplemented, nutritionally improved feed. Turkeys average a pound heavier at 24 weeks if they are fed traces of Terramycin.

More Eggs

The poultry industry was in for still another surprise. Dr. C. W. Carlson of the South Dakota Agricultural Experiment Station experimented with Terramycin as a supplement for laying hens. His results show that the antibiotic yields about one extra egg for each four eggs normally produced. This significant jump in production is accomplished by adding less than two ounces of Terramycin to a ton of feed!

The puzzle is fascinating because such extremely small quantities of antibiotics are producing these results. When used as a medicine, about two grams of Terramycin per day are required to treat a human being. It takes less than 1/10,000 this amount to speed the growth of a chicken. As a matter of fact, not much more Terramycin is added to the feed than there is gold in sea water!

How Do Antibiotics Do It?

What does a trace of antibiotic do to produce this extra meat, this additional egg, this speedy growth? Pfizer scientists admit they don't know yet, though they have theories. One of the more accepted ideas is that every animal (and man, too), no matter how healthy, may be suffering continually from "subclinical" diseases caused by microorganisms in the digestive tract. These diseases are so slight in effect that they go undetected. You just can't find anything wrong with the animal. The scientists theorize that traces of antibiotic may be knocking out such microorganisms. So far, though, the microorganisms and their effects are strictly theoretical. No proof exists. Meanwhile the animals go right on growing faster.

Lots of Proof

There's a great deal of proof, though, of this fast growth. As a result, a significant part of the 34 million tons of feed manufactured in this country last year contained traces of antibiotics.

Farm scientists aren't resting on their antibiotic laurels. Another development of the past few years is a hormone pellet that also makes livestock grow bigger and faster. And right now at the Terre Haute

(Continued to page 262)

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EVANS, Elizabeth, N. J.

"hospital" researchers are feeding, of all things, tranquilizers to farm animals. No, the cows and hogs aren't wandering around in a happy daze. The dose of tranquilizer is far below the level of sedation. As a matter of fact, you can't observe any effect on the animals—except that they gain weight about 12 percent faster.

Growth on Top of Growth

Pfizer scientists recently put steers through an 84-day trial to find out whether the gains with antibiotics, hormones and tranquilizers were cumulative, could be piled on top of each other. Apparently they can, to a great extent. The steers showed an 11-percent improvement in gain on Terramycin. Combining Terramycin with stilbestrol (the hormone) produced a 23-percent boost in rate of gain. When traces of a tranquilizer were added, there was a further 12-percent increase. Your imagination can wing off on a real flight of fancy if you use these figures as a basis for guessing the future speed-up in the growth of anything from a chick to a Brahma bull.

There has been some concern that antibiotics, hormones and tranquilizers may produce a meat that is somehow different, that it might contain significant amounts of lingering drugs, that it might be dangerous for human consumption. The Food and Drug Administration is the guardian of such worries. The agency has been extremely cautious in approving supplements for feeds. After long research, it reported that it could find no observable traces of certain antibiotics and hormones in the carcasses of animals fed these supplements. Such antibiotics and hormones have been approved. Research on tranquilizers is so recent that these drugs have not yet been approved.

Travelers Bring Soil Samples

Meanwhile Pfizer scientists are plunging still deeper into the lush and violent jungle of antibiotics. World travelers of all types—missionaries, airplane pilots, explorers, vacationers—are commissioned to bring back soil samples from remote lands.

The goal of this global treasure hunt is the discovery of still more effective drugs, antibiotics that will wipe out diseases that present drugs can't touch, antibiotics that will produce still bigger and healthier livestock in a still shorter time. Scientists are rummaging the world for these unknown organisms. A new superdrug may not be discovered for decades, or it may turn up tomorrow.

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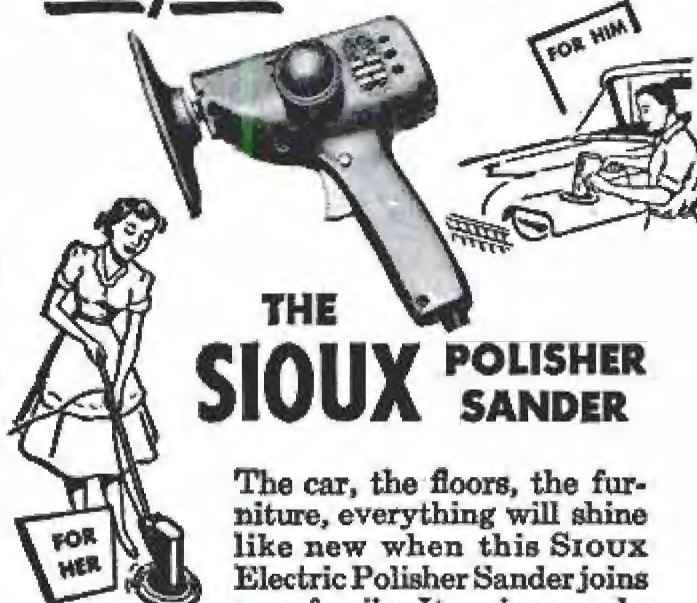
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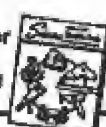
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(Continued from page 89)

rocket with one of the largest missiles, such as the Atlas, as the first stage.

It is certain that a shot to the moon would have a large prestige and publicity value for the nation which makes one. But will it also have scientific value, beyond the simple demonstration that it can be done? There are two scientific aspects which come to mind at once. One has to do with the cosmic rays. Our earth has two "cosmic-ray shields." The first is the earth's magnetic field, which deflects many of them. The second shield is the atmosphere, which absorbs most of those that the magnetic field failed to deflect. For this reason a cosmic-ray count taken in a satellite orbit still does not give the figures which scientists really want. In the first place the satellite orbit is still inside the magnetic field. In the second place a satellite orbit is, relatively speaking, so close to the earth that the bulk of the earth covers very nearly half the sky and therefore intercepts all the cosmic rays that might come from the region blotted out by the earth. But a shot to the moon would climb out of the magnetic field, and earth would be so far "below" that it would not cover much of the sky.

One other possible scientific result would depend on an accident. If the rocket happened to hit one of the dark areas of the moon we would get an answer to an astronomical puzzle. The dark areas, the *mare* plains of the moon, are so incredibly smooth that the English astronomer Thomas Gold has suggested that they might really be depressions filled to the brim with dust. A rocket hit would show whether they are that or not.

☆ ☆ ☆

THE PHOTON DRIVE. There has been a flurry of talk recently that the Russians are working on a "photon drive," and many readers wonder just what new and wonderful invention this might be. Actually it is not of Russian origin but was first discussed by an Austrian, Dr. Eugen Saenger. The idea is that a sufficiently powerful light beam should produce a reaction. But this reaction is so weak that it will be of no practical value for a long time to come. The "ion drive" is a different story. Ions are electrically charged atoms which can be accelerated with magnetic fields. This is under investigation right now, and may become practical somewhat sooner. The reaction one can get from an ion drive is rather weak, too, and it won't work inside the atmosphere. But it could power a vehicle already in outer space. ★ ★ ★



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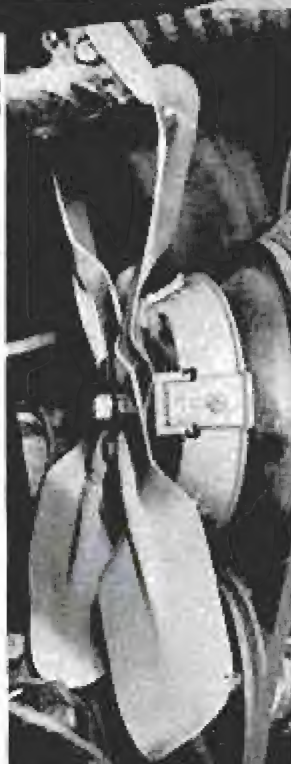
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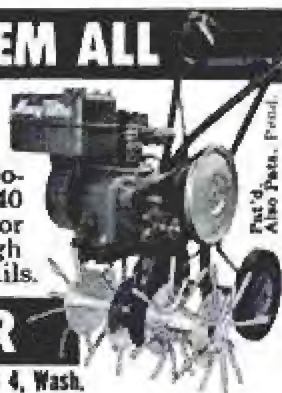
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Nemesis of the Submarines

(Continued from page 105)

such as a submarine might make as it passes through the water, registers on a rotating cylinder in the aircraft. Meantime, when the submarine is definitely determined to be in a certain area, a crewman releases a pattern of "sonobuoys." These are nothing more than sensitive little microphones and transmitters. They float on the water picking up the sounds a submarine's propellers make in the water and, sometimes, it is claimed, even the conversations of the crew inside the hull. These sounds are relayed to the airplane. A trained operator can tell the speed, course and approximate position of a submarine from the sounds his sonobuoys relay.

When a sub's position is determined, a crewman fires a smokelight onto the water to mark the spot. Further sweeps back and forth across the water help pinpoint the enemy and bring the plane closer and closer to the moment of attack. The pilot must choose his tactics and weapons carefully if he is to get the sub first time around. Conditions of the sea, wind, estimated depth of the target and other factors affect his choice. Beneath each of his wings nestles a 350-pound depth charge and two powerful five-inch antisub rockets. In his bomb bay, a giant aerial torpedo, the kind that chases a sub once it hits the water, is on call at the press of a button.

S2F pilots agree that when the attack point is reached, virtually nothing can save the submarine. "If one weapon doesn't get him, another one will," one pilot comments. "Once we know where he is, he can't slip away." As the sub contact fills his detector screen, the crewman doing the tracking yells "Contact!" The pilot presses a little button on his control column, then pulls back smoothly to climb away from the coming explosion.

Glass Bombs for Mock Raids

For practice, Tracker pilots may launch a chargeless torpedo. When the weapon makes a dull thump against the sub's side, the submarine crew knows they have been "sunk." Another practice weapon is an 18-inch glass "bomb" filled with water for ballast. Dropped on or near a submarine, the bomb explodes a small charge which does not damage but tells listeners in the sub how close the blast came and how effective a real bomb would have been. In battle, fully charged weapons would leave the sub lying somewhere on the ocean bottom, its hull ripped apart, its ship-sinking potential shattered forever.

After a successful run, it remains only for the pilot to step up his two powerful engines, climb a few hundred or a few thousand feet, and return to his home carrier. Operating far out at sea, he stands a pretty good chance of avoiding attack from enemy jet fighters. Jets consume far too much fuel at low altitudes to make a profitable attack on an S2F, climb back to efficient operating altitude, and return home.

Stalls or Spins Are Rare

Despite his slow-flying potential, the Tracker pilot can hit a 200-knot clip when he has to. Best of all, weather doesn't bother him. With barely 200 feet of ceiling and a half-mile visibility, he can make a CCA (Carrier Controlled Approach) if he must.

When a Tracker comes in over his carrier's fantail, he's practically "hanging from the props" at just above stalling speed. Yet a stall or spin in an S2F is practically unknown. One Canadian pilot training with an American squadron had his port engine quit him during a deck-launch take-off run. Thinking quickly, he feathered his dead prop and hauled back on the stick. Observers swear he was climbing as he passed over the flight deck's edge.

Even more amazing is the tale of an S2F which became the victim of a catapult misfire. Only 125 feet from the start of its slingshotlike run, the bridle, which holds plane to catapult, snapped. "In any other carrier plane now flying, he'd have been dribbled into the sea," one watching pilot declared. Somehow the powerful Tracker stayed airborne.

Best Bet Against Red Subs

Despite the fuss over supercarriers, jet attack planes and long-range bombers, the Tracker remains one of America's first-line defense weapons. Russia counts the submarine her best seagoing offensive weapon in case of war. The Russians have an estimated 475 tin fish, and are building more at the rate of 75 or 80 a year. The Tracker is the U.S. Navy's newest and finest "tin fisherman."

In the first two years of World War II in the Atlantic, America's major naval effort was antisubmarine warfare. German U-boats took a heart-breaking toll of allied warships and merchant shipping. Hundreds of billions of dollars were poured into the fight against a few hundred German subs.

"We hope it never comes to a showdown between our planes and the Russian subs," an S2F pilot reflected recently. "But if it does, heaven help the poor sub that crosses my search path." ★ ★ ★



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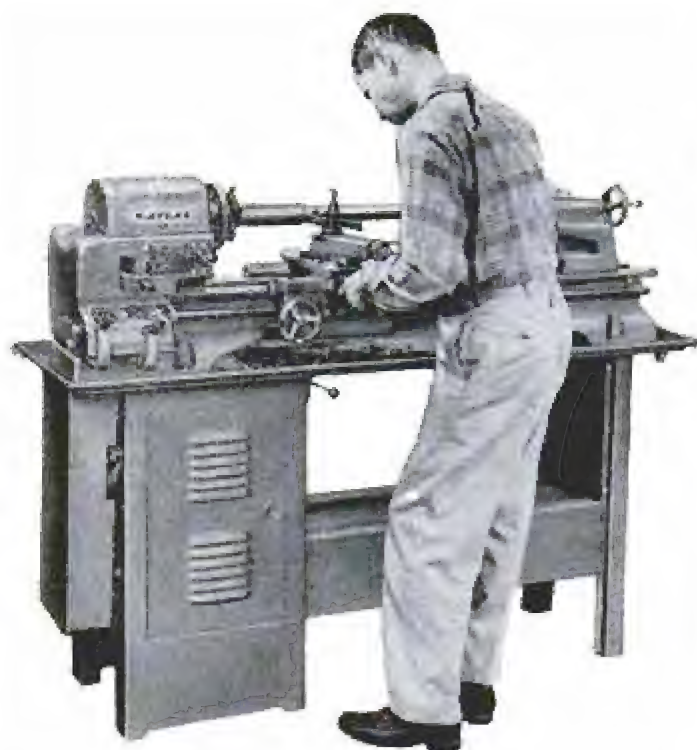
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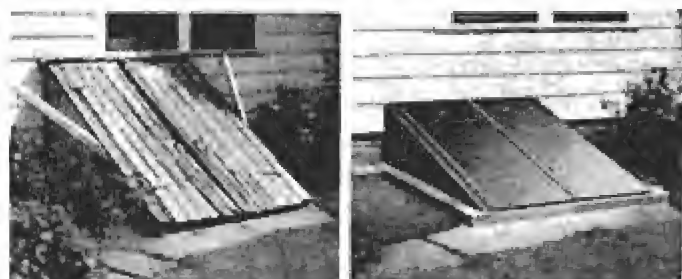
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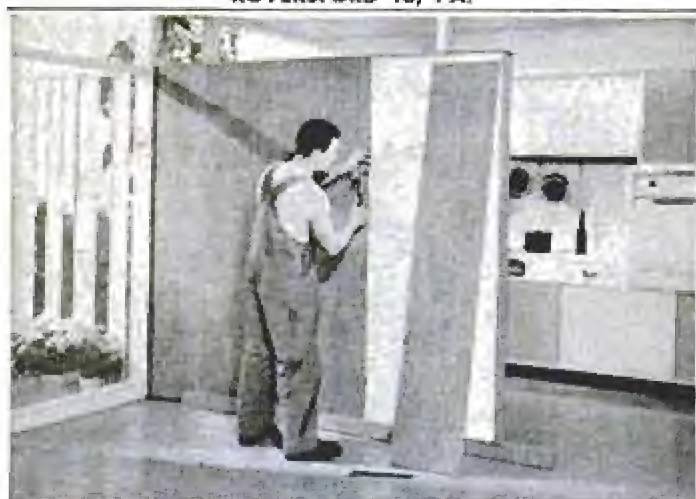
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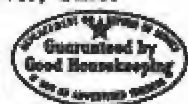
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Watch Them Build Those New Superhighways

(Continued from page 111)

the kind of designing the administrator is trying to get. "Instead of cutting away the hills," he explains, "they benched them, built the lanes on different levels and not only opened up a view but saved a considerable amount of money."

Relaxed Riding on Thruway

The 562-mile New York Thruway is an even more extensive example. This is more than a good road. It's a great one and has come to be recognized as the very model of what the Interstate and National Defense System should be, which is chiefly why President Eisenhower appointed Tallamy, who supervised its building, to his present job. I have driven this road many times between New York and Buffalo. At every curve, up every hill you rarely see less than 1000 feet ahead. As I drove relaxed and secure at a mile a minute on a roadbed that is a contractor's poem in concrete, I felt that I was looking through the windshield at a long love letter to New York State.

Most state highway departments do have men who love their land, but it takes time to jockey with highway alignments by ordinary methods—weeks to make a single alignment, weeks more to see if the road might work out better by going a somewhat different way.

Brains—Electronic and Human

So it is promising to learn that in Ohio, they are doing what the authoritative *Engineering News-Record* calls "breaking the sound barrier in highway engineering"—trying out different alignments on the electronic machines. E. S. Preston, who developed the system, explained it to me while his machines were gobbling punch cards and tape all around him, spitting out numbers, drawing lines, making cross sections. He left me behind at the first curve, but I came away with this much: It's been taking 54 months on an average throughout the nation to complete a superhighway—actual construction 24 months; 30 months for location studies and production of final plans. With his electronic zip-what-is-it, Preston is clipping about 60 percent from the time consumed in these preliminaries.

Road-building used to be something that college football players worked at during the summer vacation to sharpen their muscles. But now they have to bring along their brains and professors who know how

(Continued to page 272)

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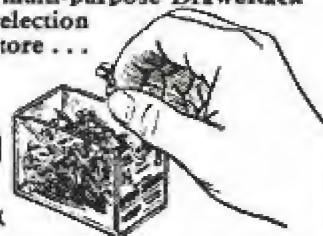
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View of one of the Lawns surrounding the lovely \$200,000 home of Spurgeon Pickering, owner of Mondo Grass Co., on the beautiful beach of the Gulf of Mexico; the entire 7 lawns, sidewalks, shoulders, and neutral grounds are planted solidly in Mondo Grass. Truly one of the Most attractive show places of the South.

Blue-Green Mondo Grass is described by the U. S. Department of Agriculture as quote "Ophiopogon Japonicus, (formerly called Mondo Japonicus), is native to Northern China and should withstand severe degree of freezing; evergreen, commonly called Mondo Grass" unquote.

This soil-forming EVERGREEN, low-growing oriental genus is currently used by many owners of distinctive homes in America for lawn grass. Now we can offer this exclusive Blue-Green Mondo Grass at popular prices.

SO HARDY IT CAN BE PLANTED ANYTIME. It is recommended for beautiful lawns where mowing is not desired. Blue-Green Mondo Grass retains its color the year 'round; thrives in shade or sun; extremely hardy, rarely requires watering; fantastically beautiful, dropping low to the ground in weeping style year after year. **REQUIRES NO MOWING.**

Ideal for heavy shaded areas or sun, dry or wet. **FREE** folder of testimonials and many photos of Mondo lawns sent on request. Mondo is resistant to diseases; insects and animals will not feed on it. Stops erosion, grows compactly, crowding out other grass and weeds; multiplies rapidly, approximately 100 times (10,000%) first year, if properly handled. Enhances property value. So sensational we expect to revolutionize lawn-making. For good coverage first year plant 2" to 6" apart. Numerous rooted blades to sprig.

Planting and culture instructions with each order. Remittance with order. Shipped prepaid. **MONEY-BACK GUARANTEE:** If not completely delighted you may return at once for refund. Open account to A-1 rated firms buying 1,000 sprigs or more, FOB Biloxi.

ORDER TODAY . . . Sprigs shipped in damp moss. Guaranteed to grow or we will replace.

25 SPRIGS \$2.98

50 Sprigs \$ 5.00	1,000 Sprigs \$79.00
100 Sprigs 9.00	5,000 Sprigs or more
500 Sprigs 40.00	per 1,000 50.00

MONDO GRASS CO., Dept. PM-3, Biloxi, Miss.

I enclose \$_____ for Prepaid Shipment
_____ Sprigs Mondo Grass.

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50% Stronger Than Government Requirements

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- Stresses evenly distributed throughout entire mechanism.
- Harder the pull on handle, the more teeth in contact.
- Available individually or in 2001 chest.
- Rugged construction; no one part bears bulk of stresses.

"SUPERCHEST"

No. 2001
6 Drawer
Metal Chest
14 $\frac{1}{2}$ x12 $\frac{1}{2}$ x25"
Chest 53 lbs.
Tools 69 lbs.
Total 122 lbs.



Complete 149 Piece set contains 51 "Super-sockets" with 37 attachments in $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ drives, 61 "Superrenches", pliers, chisels, screwdrivers, etc. All drawers lock automatically when cover is closed and locked by combination lock and hasp. Free brass, individually-engraved nameplate with each chest.

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to use seismographs, hydraulic hoes, diamond saws, vibrators, sheepsfoot rollers. There are machines that can remove eight truckloads of earth in a single bite, compacters swaying on wobbly wheels, paving trains smoking and snorting along on steel rails—a veritable industrial plant on wheels.

How to Drain a Marsh

One day I accompanied Conrad Lang, chief engineer of the New York Thruway, as he inspected construction on that part of the interstate system which will connect Massachusetts and New York through the Berkshire Mountains. From a hilltop I saw, along the graded road bed, a peat marsh being drained. They had hammered hollow pipes into the muck, filled the pipes with sand, then carefully pulled the pipes out to leave the sand standing in columns. Then they had piled up on the marshy road bed enough rock to fill not only it but a quarter mile of lowland beyond. The great pile of rock was squeezing the soggy ground like a sponge, the water in the marsh bubbling up through the columns of sand. When the marsh is dry, they'll push the extra rock off into the lowland beyond.

Rolling toward the peat marsh on steel rails was a parade of monsters that looked as if they had escaped from Walt Disney's drawing board. The rails had been laid in the shape of a concrete highway. A giant paver came first. It had revolving barrels, was draped all over with tubes, hoses and valves, and had an arm sticking out in back that was longer than itself. A bucket rode busily back and forth along this arm, dropping blobs of concrete between the rails. Each blob weighed as much as an automobile.

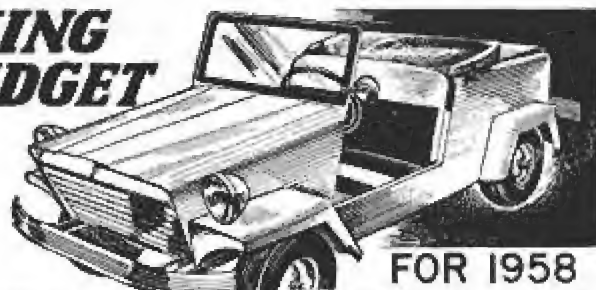
Assembly-Line Landscaping

Chuffing along behind the paver was an animated box that pushed a paddle from side to side, spreading the paver's droppings evenly. On the rails behind it rode a wide row of "feet" that were jiggling fantastically, stomping on the concrete 4000 times a minute to eliminate any voids. Behind that was a relatively dainty creation that moved a wand gently from side to side to smooth the concrete's surface.

Then, as in the circus after the parade of the elephants, came the men on foot. They were pushing long-handled wooden floats to level the imperfections, dragging stiff-bristled brooms to give the concrete a skid-resistant surface, spraying a membrane to protect it as it cured. Behind them were men sawing contraction joints in the hardened slab. And behind them were

(Continued to page 274)

KING MIDGET



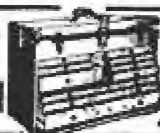
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RADIATOR SPECIALTY CO.
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3 oz. CAN
35c



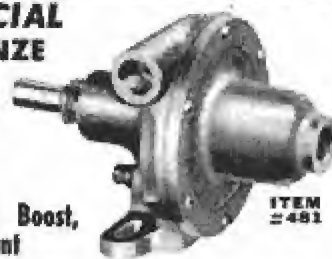
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Make up to \$3 or \$5 an hour spare time—or start a full time business with the

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Here is a steady repeat CASH business you can start at home in your basement or garage, while you are working at your regular job. No experience is necessary to turn out perfect cutting saws—"the first saw I sharpened came out 100%." I think the Foley Saw Filer is a marvel of perfection," writes Clarence E. Parsons. No canvassing—every saw you sharpen will bring you new customers. You will find you can make up to \$3 or \$5 an hour—\$20 to \$30 a week in your spare time as a starter. "My spare time saw filing business has made me \$952 these first ten months," says R. T. Chapman.

With a Foley Saw Filer you can file all hand saws, also band and cross-cut circular saws. It is easy to operate—simple adjustments—no eyestrain. Patented jointing principle evens up all irregular teeth and makes an old saw cut just like new.

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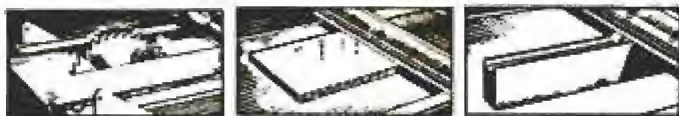
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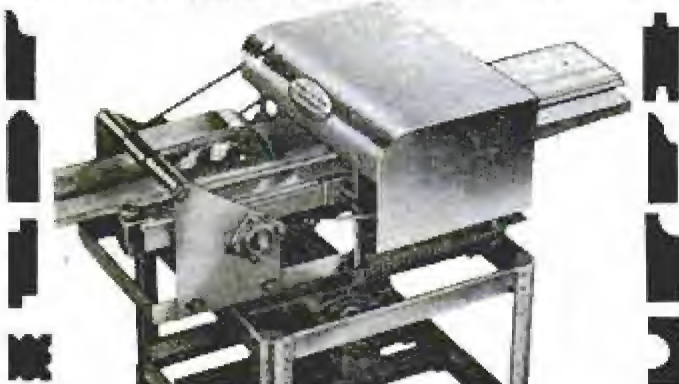
SAWS

PLANES

MOLDS



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FULLY SAFE-GUARDED, anti-kickback design.

Low Cost... You can own this money-making power tool for only \$30.00 down payment.

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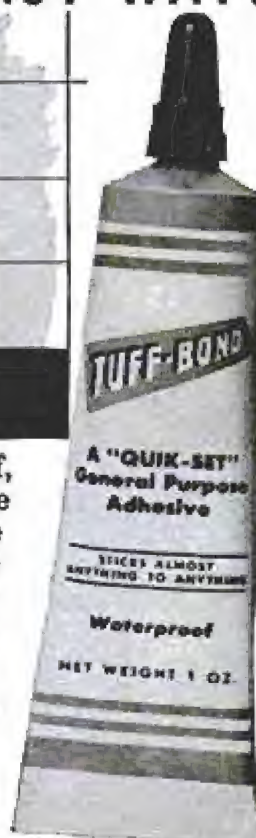
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FIX IT THIS SURE, EASY WAY!



Strong, flexible, waterproof, neoprene adhesive offers the sure, easy way to replace loose tile, repair loose plastic or linoleum sink and table tops. Thousands of uses. At better dealers everywhere. *Goodloe E. Moore, Incorporated, Danville, 11, Illinois.*

TUFF-BOND
QUIK-SET ADHESIVE
STICKS ALMOST ANYTHING TO ANYTHING



gardeners, blowing grass seed out of huge nozzles, placing shrubs and trees carefully on the island between the lanes in just the places where they can be counted on to cut the glare of approaching headlights.

Asphalt Plants on Wheels

That was a concrete highway. But paving with black top, too, has become a task for an assembly-line industrial plant. Asphalt plants are now built on wheels and travel hundreds of miles from job to job. Twenty-five years ago it took a gang of men to spread and level an asphalt mix. Now a two-man automatic paver with a roller following can do two miles of a 12-foot-wide road in a day, and the road can be opened to traffic minutes after they've passed.

Progress—progress all along the line. In Illinois, a car making 14.5 miles to a gallon of gas over an ordinary route suddenly averages 22 miles per gallon over a new superhighway. Lexington, N. C.; San Rafael, Calif.; Kokomo, Ind., and a hundred other communities that felt they were going to become victims of progress learn that even bypassed towns derive economic benefit from the new roads. In New York a trucking firm, by paying \$48,000 a year in Thruway tolls, is able to reduce its insurance bill \$50,000 a year. These are all studied and demonstrated effects of those superhighways already in use.

Driving on one is like driving on tracks. The superhighway—with its one-way lanes, its overpasses and underpasses at every intersection, its long unobstructed lines of sight, its accelerating and decelerating lanes acting like switch sidings for incoming and outgoing traffic—provides the automobile with the equivalent of an express train's road bed.

Block Signals for Cars

They are even working out a way to provide the automobile driver on these concrete "tracks" with safeguards now enjoyed by locomotive engineers. At the intersection of U.S. 77 and State Highway 2 outside Lincoln, Neb., RCA and Nebraska highway engineers have sawed some wiring into the roadway and deposited small electronic control detectors on the shoulders. The detectors work signals, which warn of approaching cars at the intersection, tell a driver in any lane he is coming too close to the car ahead, tell when it is safe to pass on a curve and when it isn't.

You may yet be driving in greater safety on roads equipped with automatic block signals like a railroad's. For greater safety, in every possible way, is being built into the new superhighways. ★ ★ ★

For Complete Engine Protection, Install a

STEWART-WARNER

"TWIN-PANEL"

Ammeter and Oil Pressure Gauge

Car Owners:
you need more than
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COMPLETE
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- includes: • Ammeter
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- Twin Gauge Panel for under-dash mounting
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Easy to install!
Fits all cars!

Battery and oil warning lights tell only half the story! They just indicate that your generator is not charging, or that your oil pressure is low. But a Stewart-Warner ammeter tells actual RATE of current flow—indicates when there is danger of burning out a generator—helps prevent overcharging or discharging battery. A Stewart-Warner oil pressure gauge tells EXACT oil pressure—helps assure safe engine operation!

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STEWART-WARNER
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5 Tools in 1 — 1 ton grip gentle release. One hand adjustment.

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EARN GOOD MONEY-Spare or Full Time IN A BUSINESS OF YOUR OWN...

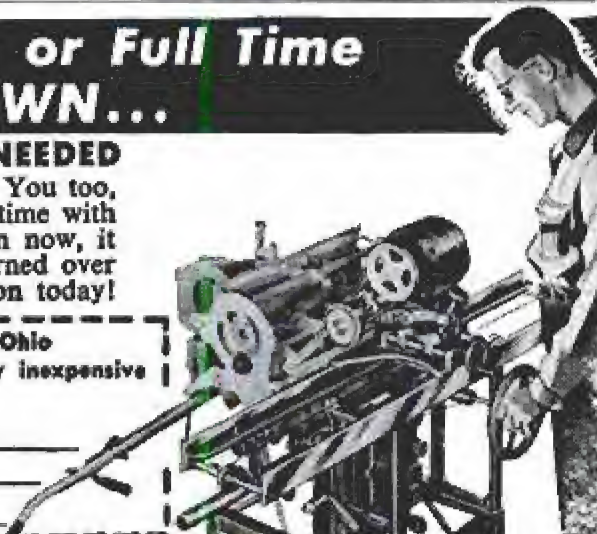
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Gentlemen: Rush me FREE details on easy inexpensive way to get into my own business.

Name _____
Address _____
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Edsel Power, Handling Rate High With Owners

(Continued from page 95)

is good for a car this size. As I do most of my own service, I like the spark plugs being where I can change them easily and the oil filter is easy to remove also."—Illinois owner.

And More Complaints

"The front seat back is too thin. Not enough padding."—Tennessee mine foreman.

"Piping between fabric and plastic on back of seat irritates your back when wearing a sport shirt."—New York cost engineer.

"Heater control does not work as it should. Dial must be turned to almost full otherwise you get cold air."—Ohio tire-company worker.

"Automatic transmission is very rough when shifting. When it goes from starting gear to high it slips for a few seconds then takes hold with a grab."—Maryland owner.

"Push-button shift on the steering post requires visual attention to operate. It's easy to push the wrong button."—California physician.

"My three-year-old son can reach the push buttons. What happens if he pushes one of them while I'm driving?"—Illinois businessman.

"If Park button was elsewhere than in cluster there would be less chance of pushing it by mistake. Should be on dash above parking-brake release."—Illinois designer.

"Have to bail out water from the depressed floor after the car stands out in the rain all night."—Virginia housewife.

"Rear floor mat does not stay in place. Had to have screws put into floor to hold it."—Wisconsin chemist.

"On a cold morning, the engine idles so fast it moves the car at 40 miles per hour. I have to keep my foot on the brake all the way to work to hold it down to the legal speed limit."—Ohio toolmaker.

"The glove compartment is exceptionally small."—Wisconsin brakeman.

"Station wagon looks too much like a Ford."—Massachusetts manufacturer.

"It seems as though everything on it but the body is extra, extra, extra. Costs too much. With the extras mine cost \$4088. And as far as I can see it has nothing other cars haven't had for years."—Arkansas publisher.

"Lack of instruments. I like dials because they make it easier to check on battery and engine. Lights only tell you a thing is or is not working, but not how it is working."—Michigan guard.

In each PM Owners Report survey we ask the owners to make one suggestion to the entire industry. Here are some of the more interesting suggestions:

"I see no reason for automobiles that are 18 feet long and weigh two tons and yet seat only four persons, rather uncomfortably at that. One must be a contortionist to enter and then, once inside, there is no adequate foot and head-room for the normal man, particularly in the back seat. The Edsel is as good as or better than the other medium-price cars in this respect."—Georgia professor.

"Put the headlight dimmer switch in a more convenient place. I recommend the center of the steering post."—Florida plant foreman.

"Have each maker try to be different rather than con-

(Continued to page 280)

Seemed to be very little range to heat control in test car. Had to be almost wide open to get any heat. Power assist is good, but it's another potential trouble causer.

Over 6 m.p.h., nothing happens if Reverse or Park is pushed. Below that speed, the car stops with a violent shudder.

This is due to action of automatic choke—a good argument for the old hand choke.

Can't see value of drum-type speedometer. With needle you can "sense" speed by relative position of needle on dial. With drum, you have to read the figure to know how fast you are going. As for lights versus dials: It's an old argument. Edsel lights are mounted too low.

The professor makes a lot of sense, but people still seem to buy big cars when given a choice. Guess people don't make sense.

For clean oil all the time
call for

 **HASTINGS** 

Only Hastings Oil Filter Cartridges keep oil clean *all the time*, because only Hastings has Densite filtering material.

Densite is different! Millions of selected cotton fibres—pressure packed—trap even the most microscopic dirt particles. Only Densite keeps oil clean from filter change to filter change, when replaced as normally recommended.*

Next filter change, call for Hastings—for clean oil *all the time*! Hastings Manufacturing Co., Hastings, Mich. Also makers of Piston Rings, Casite, Wear Reducer, Spark Plugs.

**Proved by tests conducted in accordance with U.S. Bureau of Standards procedures.*



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Complete All-Family Power Work Shop

Dremel Moto-Shop is the first real multi-purpose workshop designed for the whole family. In one compact, portable unit you have a jig saw, disc sander, buffing wheel, bench grinder, and a flexible shaft machine. 5 power tools in 1 unit that do 1,001 jobs. For the kids it provides hours of constructive, creative recreation. It's invaluable to Dad, and even Mom, for hobby work and home maintenance. Moto-Shop is not a toy, but a professional-quality power tool with a ball bearing rotary motor. It's super-safe; cuts $\frac{3}{4}$ " wood, metal, plastics, etc.; sets up anywhere, can be carried from room to room. Outperforms heavier, more expensive jig saws. See your power tool or hobby dealer today.

Model 571 (jig saw with disc sander attachment)\$33.95

Model 572 (with all attachments shown) ..\$49.95

FREE Moto-Shop Catalog. Write today!

DREMEL MFG. CO. Dept. 118C, Racine, Wis.

**5
POWER TOOLS
IN ONE**



Model 572



**WELD BRAZE
SOLDER CUT**



4 WAY

**ONLY
\$14.75**

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WELDER

Complete with
Twin Carbon Arc
Torch and ac-
cessories... to
handle all metal-
craft work.

Acclaimed by thousands of Homeowners, Mechanics and Hobbyists as the welder of 1901 uses. Easily operated from properly wired 110 volt AC or DC line. The ideal gift with a life-long use....Order today on 10 day money back guarantee.

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Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of woods, 6" diameter heavily varnished cardboard. Send 25c, no stamps, please to Greenlee Tool Co., 2103 Columbia Avenue, Rockford, Illinois.



Find HIDDEN TREASURES

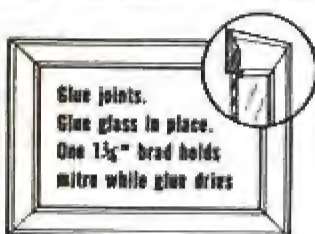
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WHITE
GLUE**



Glue joints.
Glue glass in place.
One 1 1/2" brad holds
mitra while glue dries

**MAKE PICTURE FRAMES
without dowels or splines**

You'll like it better. Sim-
plifies woodworking.
Sets quick, dries clear,

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pull the trigger...

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Paints anything from a house to a toy. Saves its cost on the first major job! Speedy Sprayer does in minutes what brushing takes hours. Finish is smooth, flawless. Uses any 1/4 h.p. motor with 1/2" shaft. No. 780 Outfit—10 ft. air hose, tire chuck, quart gun, less motor, only \$32.00. Every work-shop should have it. At leading stores.

Free! Write for "How To Spray" Booklet and folder.

W. R. BROWN CORPORATION

Specialists in Portable Paint Sprayers for Over 37 Years
2635 N. NORMANDY AVENUE, CHICAGO 35, ILL.

Other comments on test car: Power is so great that driving in rain is almost as treacherous as on ice. Wheels spin on wet pavement with anything but the most delicate accelerator pressure.

Big windshields are fine, but in snow or rain there is a wide swath of unwiped glass blocking vision in center.

Wiper switch worked very poorly.

Excellent control of windshield reflections. None at all appeared in night driving.

Radio had very poor tone quality.

Altogether a satisfactory car, but its distinctive character seems limited to styling.

form to a pattern. That is what I like about the Edsel."—Wisconsin minister.

"For years most cars have been misrepresented as being six-passenger models. Except for children, there is no leg-room in the center of either seat."—Texas underwriter.

"Put a decent gas-filler pipe on the cars. When gas is spilled, the filling-station attendant always gets blamed for the mistake of the engineer."—Wisconsin filling-station operator.

"Add a control that would increase or decrease the sound that signals when directional lights are blinking."—Connecticut executive.

"I believe that my Edsel is above average. But the industry trend to longer and wider cars is not in the public interest. The added width is dangerous on some of our older narrow roads and also on city streets when cars are parked on both sides. Cars have too much horsepower. I would like a somewhat plainer car and a lower price."—Oregon field auditor.

"I own four cars, three of them being big cars which are so-called gasoline hogs. If you have a good troublefree engine getting 5 or 6 miles per gallon less than other engines it isn't worth worrying about. I have known people to spend enough on their cars trying to save gas that they would have to get 50 miles per gallon to pay for the garage bills."—Indiana funeral director.

There you have it, the story of the new Edsel as told by the people who know it best—the owners themselves.

At the moment, Edsel sales are not going well, but neither are sales of most cars. As one owner says, "If there was a mistake in bringing out the Edsel, it is not in the car, but in the time it was brought out. It's a good car." ★ ★ ★

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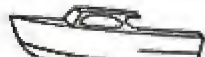
OUTBOARDS

- 11' (Plan 35)—Fast, roomy car-top utility model.
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10" TILT/ARBOR SAW BUILD-IT-YOURSELF from GIL-BILT KITS-PLANS

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Up to 3,000 GPH; 450 GPH 80' high; or 1800 GPH from 25' well. Use 1/4 to 3/4 HP motor. Coupling included free. 1" inlet; 3/4" outlet. Stainless steel shaft. Won't rust or clog. Type P—\$7.95

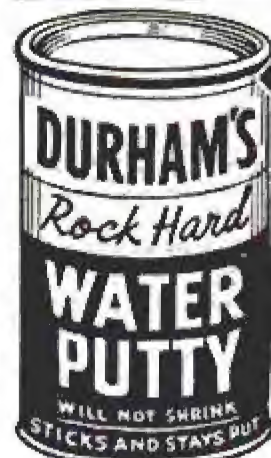
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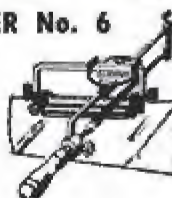
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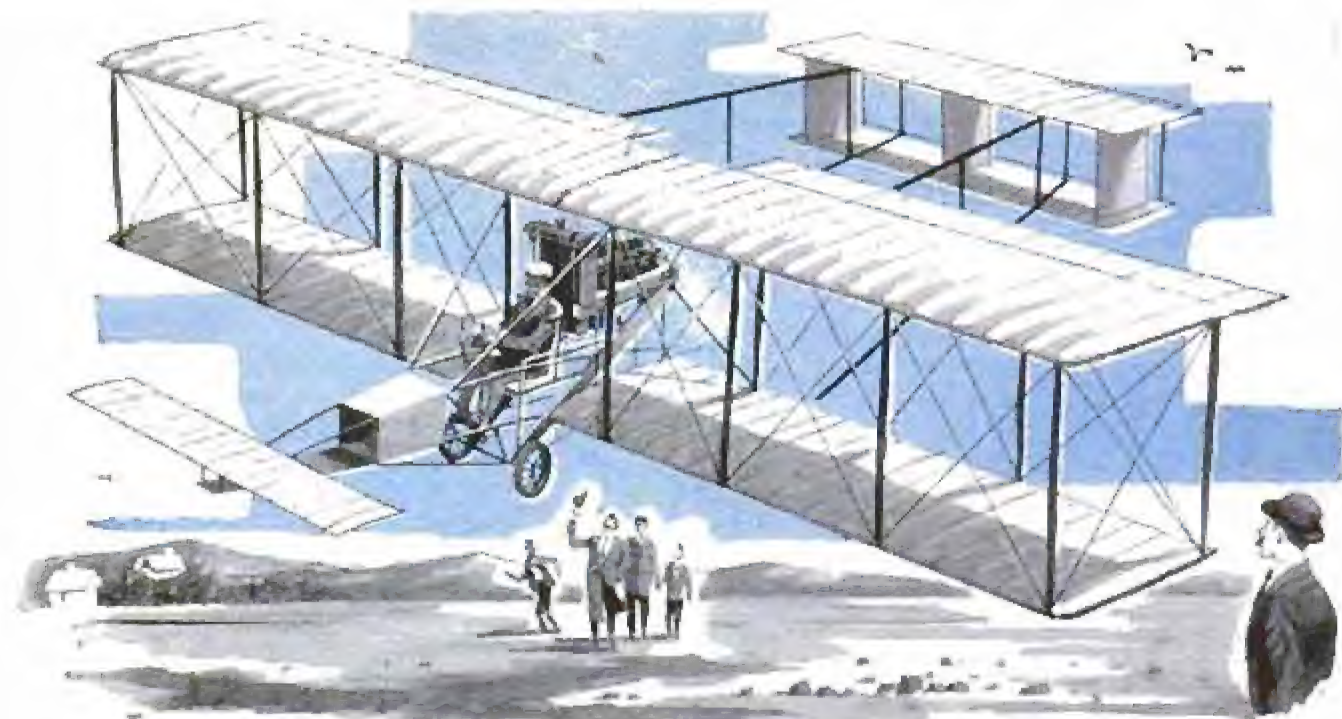
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"His Remarks Were Quite Prophetic"

POPULAR MECHANICS recently received the following letter:

"I write this letter on the Golden Anniversary of the United States Air Force. This morning a copy of your magazine, dated July 1907, was brought to my attention. It contained two articles of interest. One was entitled 'The Dangers of Flying' by L. J. Lesh, and the other, quoting Alexander Graham Bell, allowed that the problems of air navigation had been solved. . . . His remarks were quite prophetic. . . . In a release regarding the 50th anniversary of the Air Force we would like to reprint both articles. . . ."

George N. Kent, Captain, USAF, Information Officer,
Mather Air Force Base, Calif.

We were pleased, of course, to grant permission to reprint the two articles. In addition, we feel some of our 1958 readers would like to see the prophetic remarks written in 1907. The two articles follow.

THE DANGERS OF FLYING

By L. J. Lesh

How often nowadays we hear remarks such as this: "He has succeeded in flying, has he? Well, let him fly; but you can excuse me when it comes to anything as dangerous as that." Yet the same person who swears that he would not ride a flying-machine for all the money in the Bank of England does other things merely for sport that are fully as dangerous as flying (with the machines we now have at our command); things, too, that give him vastly less pleasure than he could get out of a strongly made and well tested aeroplane.

To the inexperienced aviation seems attended by dangers that loom up as almost

too great to be braved by a human being, and the would-be flying man is accordingly quite surprised when he finds that, after a little practice, a flying-machine is almost as safely and easily handled as a bicycle. In fact, he finds that about the only difference between coasting downhill on a bicycle and sliding upon the air on a gliding machine is that in the latter it is necessary to instinctively adjust the fore and aft balance, which in the bicycle is always preserved as long as the two wheels touch the ground.

The first machine to carry a man through the air for any considerable distance was the Lilienthal soarer, which, however, possessed such poor fore and aft balance that it could not be safely operated in winds of over 20 miles an hour. It was this defect,

(Continued to page 284)

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START THIS SHOP FOR \$17.10 DOWN

All you need to actually start building this shop is a Delta 9" Tilting Arbor Saw—basic tool of all woodworking—and you can have it delivered for as little as \$17.10 down! Later you can add other New Advanced Design Delta tools—11" Drill Press, 4" Jointer, 10" Band Saw, Shaper, 14/11

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coupled with its bad condition of repair, that probably caused the death of its operator.

Since Lilienthal's death earnest attempts have been made towards producing a machine that should be structurally strong and possess good equilibrium, even though less important features had to be omitted to make these conditions possible. These efforts have produced the Chanute and Wright types of aeroplane, which are satisfactorily strong and safe to handle, and yet are quite efficient in flying qualities.

The truss construction now used by nearly all aeronautical engineers provides



such a strong and rigid framework for the aeroplane surfaces that breakage of this part of the machine seems practically impossible. The part of future dynamic aeroplanes that will undoubtedly cause the most trouble will be the motor, for as yet none has been developed that is even reasonably immune from breakage and stoppage. Of course, if the motor stopped a flier would have to come down, and if it happened to be flying over an undesirable landing place and did not possess the power of gliding flight it might come to grief when it lit.

The recent flights of the Wright brothers seem to indicate that they have found either a successful equilibrium preserving device or a vastly improved arrangement of steering surfaces, so that at last we can cease bothering about the balance and control of a machine.

The Wright flyer is capable of being steered with even greater accuracy than an automobile or bicycle, and yet the operators have spent far less time in actual practice

than is required to obtain a mastery over either of the last two conveyances.

To a person who has had considerable experience in the air the possibility of accident seldom occurs, and indeed the motion is so rapid that there is no time to think about it during a flight. People seldom think of the risks they run while riding at 100 miles an hour in a railway car, or half a mile a minute in an automobile, and it is quite probable that after the novelty of the thing wears off there will be few people afraid to experience the quick rush of the aeroplane.

AERIAL NAVIGATION A SUCCESS, SAYS DR. BELL

"The problem of aerial navigation already is solved and America is in advance of the rest of the world in heavier-than-air flying machines." This was the emphatic statement made by Professor Alexander Graham Bell in England, recently, whither he had gone to receive the degree of doctor of science conferred upon him by Oxford. Dr. Bell declares that "there is left only the problem of improving the machine that has been invented" by the Wright brothers, and others, and that "great credit is due Mr. Octave Chanute of Chicago," who not only induced young Americans to experiment, but paid much of the expenses out of his own pocket. In regard to future developments, Dr. Bell said:

"The development of the airship, I think, will come for other than commercial reasons, for the flying machine is destined to take an important part in warfare. The war departments of different governments are watching with greatest interest whatever is being done in this direction, and once a successful airship is given to the world its growth toward perfection will be more rapid than anything ever seen.

"The airship will overturn all present methods of warfare. Then, too, wealthy men will take to airships as they have taken to automobiles, and the machines will be developed for speed. They will undoubtedly be utilized for purposes of rapid and light transportation, such as carrying the mails."

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FAMOUS NAVY MK14 AIR COMPRESSOR



Great for tree, termite, airbrush & paint spraying; filling tires, aquariums, etc. Dual & remote control electric receptacles. 115V 60 cycle AC, 1/3 HP, Westinghouse Motor, Direct drive. Water & explosion-proof. Built-in air filter, adjustable pressure setting up to 47 lbs. Built-in pressure gauge. Self-contained switch. Mounting brackets. These units made under license of Sperry Gyroscope Co. Wt. 68 lbs. gross. Approx. GOVT. COST \$585. Like NEW. \$21.95.

With portable steel hand cart (shown), rubber wheels, specially constructed for mounting this unit. Incl. 15' rubber air hose, 6' extension cord with plug & fittings. Wt. 78 lbs. Complete with cart—\$26.95.

ARC WELDER KIT—\$26.00

Build your own complete make-up package incl. 1 Aircraft DC Gen. 200 Amps, 24 V; Rheostat, Toggle Switch, 1 Ammeter, Electrode Holder, Welder's Shield, Voltage Reg. Simple instruction wiring diagram. Wt. under 100 lbs. Approx. GOVT. COST \$475. Like new, perfect. All units guaranteed pre-tested. \$26.



BUILD YOUR OWN ARC WELDER, LIGHT PLANT OR BATTERY CHARGER \$37.50

Kit incl. 1 Navy NEA-5 Gen. combination AC-DC type. AC 115 V. DC 24 V., 200-300 Amps. 2 complete generators in 1, yet no larger than reg. gen. Ideal for home, shop and farm lighting plants. Delivers 1200 Watts AC, DC side for charging batteries, welding and operating war surplus motors. Also in kit: 2 Voltage Regs., AC & DC, Reverse Current Relay, 1 Ammeter, Rheostat, Electrode Holder, Toggle Switch, Welder's Shield, Wiring Diagram for kit. Wt. under 100 lbs. Approx. GOVT. COST \$630. Kit—\$37.50. Navy NEA-5 Gen. as above, purchased separately. \$23.50.



R1 GENERATOR KIT

Jack & Helms or GE. Rated 300 Amps. 24-32 V. With same items as above. Approx. GOVT. COST \$600. Complete 80 lb. kit—\$36.

HEAVY-DUTY RHEOSTAT

Ideal for regulating voltage on electric welders. Rated 5.75 Ohms, 100 Watts with double windings & dual female 25 amp., 125 V. receptacles. 7" hi x 5 1/4" D. Shpg. wt. 2 1/2 lbs. Approx. GOVT. COST \$25. Brand New. \$2.25 ppd.



BENDIX GEROTOR PUMP & MOTOR

Use wherever fluid pumping required. Excellent for hydraulic installations. Max 3/4" pipe connections. Built-in relief valve adjustable up to 1500 lbs. Max. cap. 6 GPM. 1 1/2 H.P., 24 V. motor. Use on 12 to 30 V. Approx. GOVT. COST \$350. NEW. \$10.95.



140-1 REDUCTION GEAR For beaching boats, winches, hoists. Ideal for motor in golf or boy's electric car. Built-in (removable) DC motor & clutch. Hi torque, 10 speed. Runs on 6-12 or 24 V. Wt. 65 lbs. gross. Approximate GOVT. COST \$300. Like NEW. \$12.00. Matched splined gear for above—\$3.00 ea.



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Contains 300 assorted Dupont Explosive Rivets, 1 set of 9 fractional drills, 1 Butane Blow Torch with extra cartridge—everything needed for blind riveting. Torch can also be used for precision soldering, brazing, etc. 3500° pinpoint flame. Approx. GOVT. COST on rivets alone, \$90. Complete kit \$5.95 ppd.

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Essential wherever blind riveting required. 1/8", 5/32", 3/16". Round & Flat heads. Approx. GOVT. COST 32c ea. 1,000 assorted for only \$5.00 ppd.



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Runs on 12 or 24 V. Centrifugal type. Pumps 500 GPH. Complete with on and off switch rheostat, 2 speeds (hi & lo). Mfd. by Ingersoll-Rand. Shpg. Wt. 7 lbs. Approx. GOVT. COST \$195. NEW. \$6.95.

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Built to U.S. Navy & Air Force specs. Standard brand. For counting revolutions per min. for any rotating shaft. Can be used on speeds up to 3050 RPM. Accuracy to 1/10 of 1%. Complete with male & female tips & shock-proof case. GOVT. COST \$87.50. NEW. Only \$19.95 ppd.

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Black crackle finish frame. Easy-to-read graduations in .001. NEW. 0-1" cap. \$2.45 ppd. 1-2" cap. \$3.75 ppd.

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Genuine rock maple radio drone "prop." perfect for den, trophy room, boy's room. Smooth, highly varnished. 30" tip to tip. Clock, barometer or photo can be inserted easily into center (mounting holes provided). Can use to operate ice sleds, etc. Approx. GOVT. COST \$57. NEW. \$4.95 ppd.

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Ideal for boats, cars, etc. Grad. in 5° increments. Liquid-filled. Lighted. Poly-plane compensator. Panel mounting. 3 1/8" dia. face; 4 1/2" deep. Checked & tested in our own lab. Approx. GOVT. COST \$150. Like NEW. \$19.95 ppd.

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Used by USAF & commercial airlines. Makes pictures & azimuth circle for air or marine navigators. Great for astronomers. Incl. carrying case. Tested for accuracy in our own lab. Approx. GOVT. COST \$400. Now \$10.95.

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Ideal for welding, battery charging, emergency lights for cabins, camps, aircraft, trailers or wherever power needed. Easy rope pull starting. Fully equipped, ready to start. 2000 W., 32 V., 5 H.P. Like NEW. Tested. Shock-mounted. Deluxe type. Net wt. 115 lbs. Gross wt. cased 200 lbs. Approx. GOVT. COST \$700. Now—\$45.00. 2500 W.—\$75.

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Using nylon strings, a glass-fiber body and a cast-aluminum base, Earl L. Thompson of Silver Spring, Md., has produced an inexpensive, lightweight harp with much of the tonal quality of a concert instrument. Thompson's harp has 18-inch legs which can be detached to bring the instrument down to a level more convenient for children to play it. The 31 strings have a tension of 1300 pounds, compared to about 700 pounds for a big concert harp. The harp weighs only 14 pounds.

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Use with any size drill. Consists of 1 ea. lamb's wool with bonnet buffing pad, rag wheel, Tampico straw wheel, wire wheel, stone grinder, rubber backing pad, & polishing paste. Also 6 sanding discs, 10 high grade carbon steel drill bits sized 1/16" to 1/2", adapter, washer & screw. Ready to use for every do-it-yourself chore. Has 1001 uses. Easily a \$10.00 value. **\$3.89 Ppd.**

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Use on portable elec. or pneumatic drill. Simple to use. Remove standard hand handle. Screw in 1/4"-14 thread pressure handle. Fasten one end to work; other end over handle. & slight twisting pressure on handle turns worm gear and rotates sprocket. Drill with ease, safety, and complete control. Full operating instructions and pictures. Reg. \$20. **\$6.48 ppd.**

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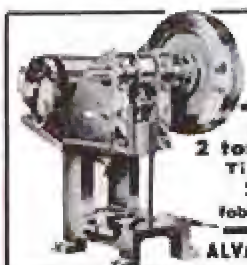
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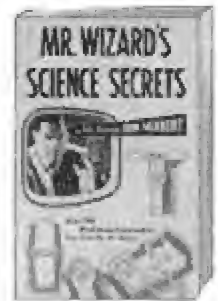
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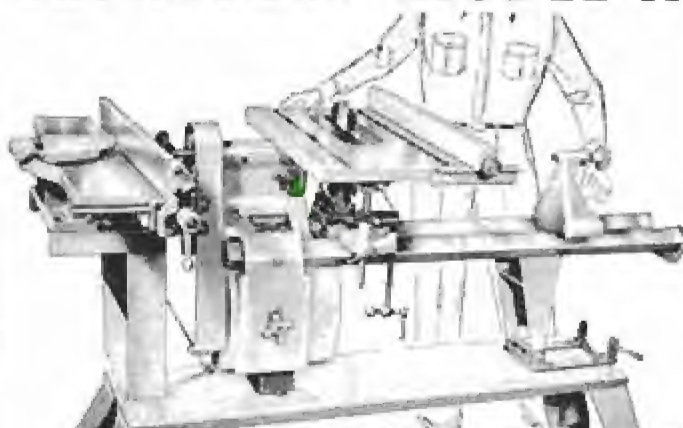
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A husky, 750 watt plant (designed for battery charging only) that will charge 6 or 12 volt batteries in just minutes! When mounted with two 6 volt batteries it provides a terrific cold weather motor starting unit, as well as a fast charger! Charges all batteries anywhere—no hi-line current needed. Ideal for service stations, garages and farms. Comes complete with ammeter and cutoff. (Item 821) Wt. 120 lbs. Regularly \$295. Our special, only. **\$119.50**

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(Item 38A) Wt. 110 lbs. \$450 value

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\$500.00 value
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Same plant with electric self starter (Item 31a)... **\$359.50**
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Pump only (Item 836a) only... **\$23.50**
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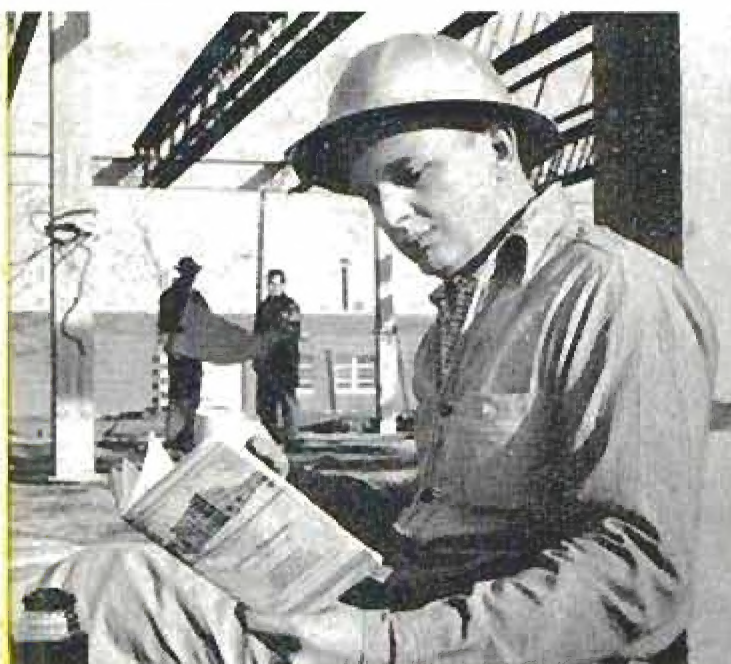
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"Boy, it's tough," said the left rear. "Carrying car tonnage at 70 M.P.H. is bad enough without the driver punishing us, too."

"Yeh, sudden starts, stops and fast, sharp turns grind off rubber," said the right rear.

"Banging and scraping against curbs and rocks is bad," added the right front. "And

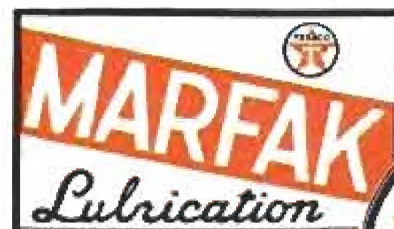
under-inflation shortens our lives."

"Yes," replied the left front. "And the front wheels have excessive toe-in that's scraping us to the cords. When I blow the boss won't like it."

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